VR Builder Manual

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Introduction

VR Builder helps you create interactive VR applications better and faster. By setting up a Unity scene for VR Builder, you will pair it with a VR Builder *process*. Through the VR Builder process, you can define a sequence of actions the user can take in the scene and the resulting consequences.

You can easily edit a process without coding through VR Builder's Workflow Editor. The Workflow Editor is a node editor where the user can arrange and connect the *steps* of the process. Each step is a different node

and can include any number of *behaviors*, which make things happen in the scene. Likewise, a step will have at least one *transition* leading to another step. Every transition can list several *conditions* which have to be completed for the transition to trigger. For example, step B can be reached only after the user has grabbed the object specified in step A.

Behaviors and conditions are the "building blocks" of VR Builder. Several of them are provided in the free version already. Additional behaviors and conditions are available in our paid add-ons. Since VR Builder is open source, you can always write your own behaviors and conditions as well.

Behaviors and conditions can interact only with *process scene objects*. These are game objects in the scene which have a Process Scene Object component on them.

The interaction capabilities of a process scene object can be increased by adding *scene object properties* to it. For example, adding a **Grabbable Property** component to a game object will let VR Builder know that the object is grabbable, and when it is grabbed.

Normally it is not necessary to add properties manually to an object. When an object is dragged in the inspector of a condition or behavior, the user has the option to automatically configure it with a single click.

Where possible, properties try to add and configure required components by themselves. If you add a **Grabbable Property** to a game object, this will automatically be made grabbable in VR (it still needs to have a collider and a mesh, of course).

This makes it very easy to start from some generic assets and build a fully interactive scene.

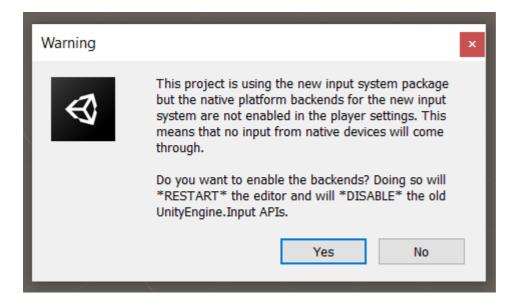
Requirements

VR Builder is supported on Unity 2019.4 or later.

VR Builder works out of the box with any headset compatible with Unity's XR Interaction Toolkit.

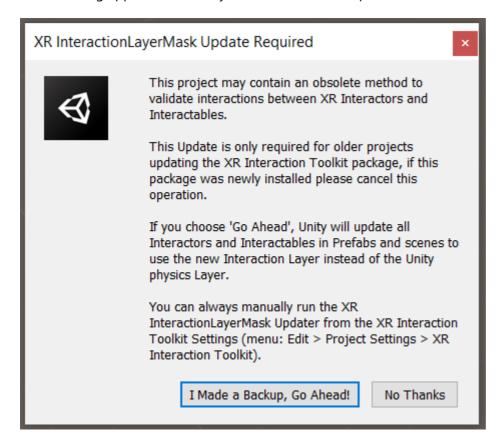
Installation

Download and import the VR Builder package from the package manager. VR Builder will compile and import some dependencies. If Unity's new input system is not selected in the player settings, the following window will appear prompting the user to automatically switch.



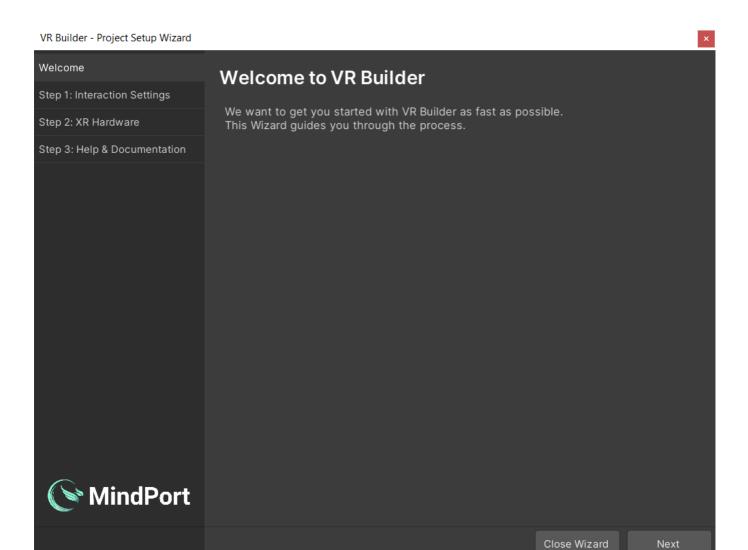
Click Yes in order to restart the editor and enable the new input system. Note that the new input system is required by VR Builder, but you can enable both the new and the legacy one if it makes sense for you to do so.

Then a dialog appears from Unity's XR Interaction Component.



VR Builder should work with either choice, so select the option that better suits your existing project, or just go ahead if starting from a blank project.

After the automated restart, the New Process Wizard pops up.

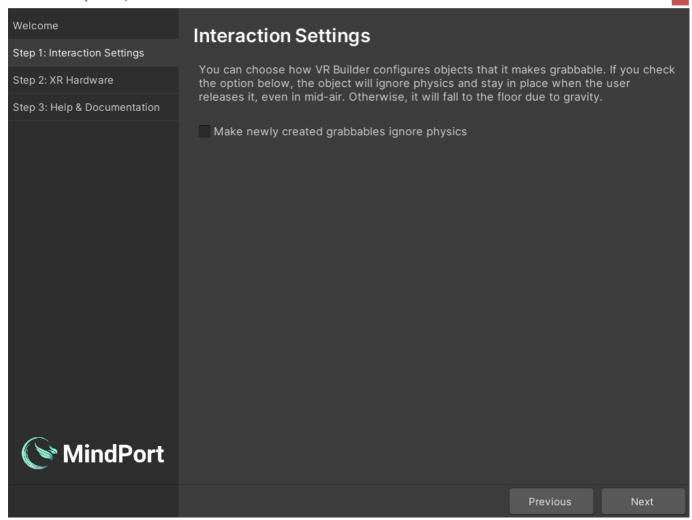


Click Next to proceed to the interaction settings page setup page.

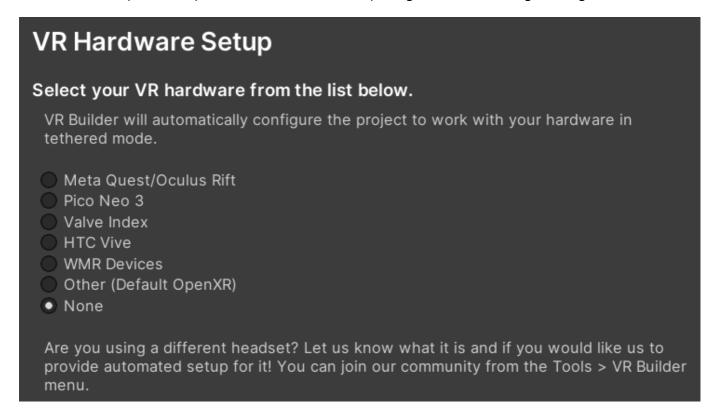
Here you can configure some default settings related to VR Builder interactions. Right now, the only available setting will determine whether a newly created grabbable object will use physics or not.

You can also change these options at any time in Project Settings > VR Builder > Settings.

After reviewing the settings, click Next.



Finally, if it's not configured already, you will be able to configure your project to work with your VR hardware. Select one of the provided options to install the relevant packages from the Package Manager.



Now the setup is complete and you can start working with VR Builder!

Quick Start

You can get a first impression of VR Builder and its features by accessing the provided demo scene. This sample scene contains a pre-built process that showcases some of the interactions provided in VR Builder.

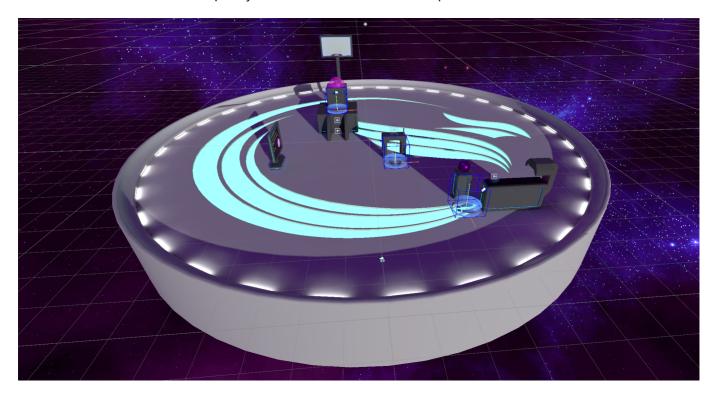
You can automatically open the demo scene at the end of the setup wizard, or use the shortcut in Tools > VR Builder > Demo Scenes > Core. Note that, while the scene can be found and opened from disk, it is necessary to use one of the above methods at least once in order to automatically copy the process file to the StreamingAssets folder, where VR Builder processes are saved.

Demo Scene Overview

The demo scene showcases how to assemble a process with the building blocks included in VR Builder. More building blocks and features are available as separate add-ons.

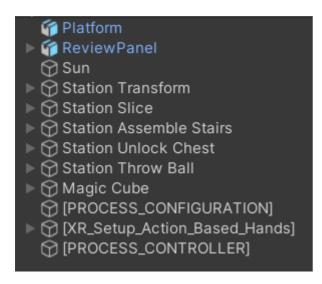
These building blocks are either conditions or behaviors. Conditions check if the user or the world is in a certain state, and behaviors modify the world state when activated.

The process in the demo scene is linear, and will guide the user through different steps. To try out the demo scene, ensure audio volume is up, or you won't be able to hear the spoken instructions!



Demo Scene Hierarchy

In the hierarchy there are three game objects in parentheses.



They are automatically added to every VR Builder scene.

- [PROCESS_CONFIGURATION] allows to select the process for the current scene from a list of processes saved in the project.
- [PROCESS_CONTROLLER] defines some parameters for processes in this scene like the spectator input bindings and camera.
- [XR_Setup_Action_Based_Hands] is the VR rig used by the default XR interaction component. If you are using a different interaction component, for example to use VR Builder in conjunction with Interhaptics or VRIF, you might see a different rig here.

By looking at the other objects in the scene, we can see that some have a Process Scene Object component and possibly some "property" component. A Process Scene Object is an object with a unique name that can be accessed by the process. Properties define how the process can interact with the object. For example, a Grabbable Property will let VR Builder recognize if an object is being grabbed. Adding a Grabbable Property to an object will automatically make it a Process Scene Object and add a few components so you can interact with the object in VR.

If these properties are not added manually you will usually be prompted to add them automatically when building the process of your VR application.

Customizing the Rig

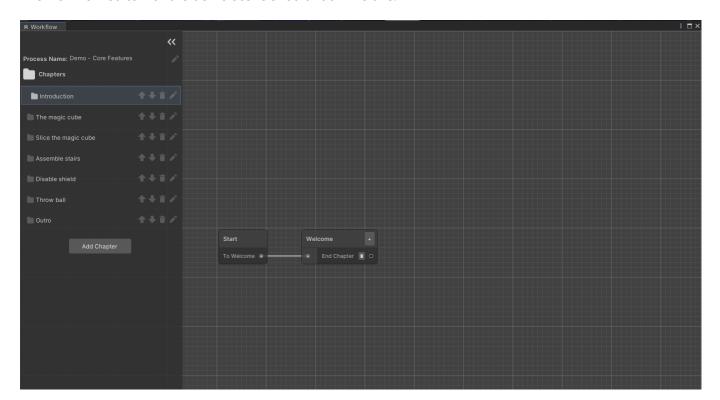
Since VR Builder 2.2.0, the rig system has been simplified by removing the [INTERACTION_RIG_LOADER] and dummy rig. The default rig is created directly in the scene and can be edited or replaced like any game object. If you plan to use the same rig in multiple scenes, just create a prefab of it and manually replace the default rig.

The only requirement every VR Builder rig has, independent of the interaction system, is that it must contain a User Scene Object component. This component identifies the rig as the user, and is usually placed on the head (the main camera).

It is also possible to add other Process Scene Objects on the rig in order to use hands, backpacks, toolbelts and so on in behaviors and conditions, depending on the use case.

Workflow Editor

The Workflow Editor lets you design the process of your VR application. You can open the Workflow Editor from Tools > VR Builder > Open Workflow Editor or Window > VR Builder > Workflow Editor. The workflow editor for the demo scene should look like this.

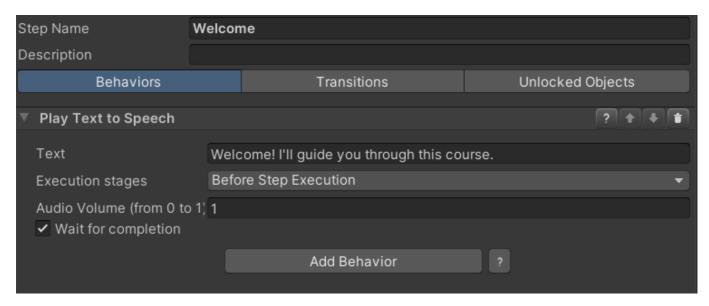


On the left, there is a list of chapters. Every chapter is a separate section of the process. They are useful to separate a process in its logical steps and avoid too much clutter in a single graph.

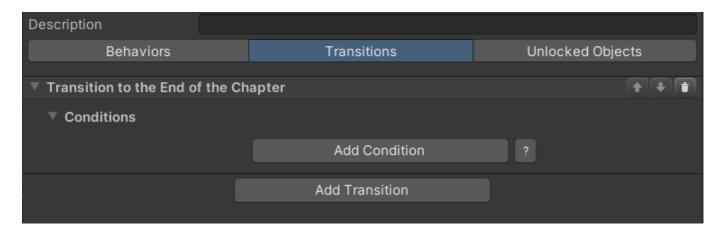
You can click on the different chapters to visualize the corresponding graphs.

On the right, there is a graphical representation of the current chapter. Every node is called a Step. Every step can include a number of Behaviors which can happen when the node is triggered or before leaving it. In the demo scene, those are mostly text to speech instructions. A step can have as many exit points, called Transitions, as needed. Every transition can list a number of Conditions which, if fulfilled, make the transition valid.

Select the "Welcome" node in the first chapter. This will open the Step Inspector. The window should look like the following.



The only behavior is a text to speech instruction that will be triggered when the node is entered. Click on the "Transitions" tab.



There is a single transition. A step can have multiple transitions, each leading to a different step. In this case, the transition is connected to no other step, so it will end the chapter. The next chapter, "The magic cube", will then start.

Transitions can include conditions. If they do, they will trigger only when the attached conditions are completed. This transition has no conditions, so it will trigger immediately after the current step has ended, without any input from the user.

We encourage you to investigate the other nodes to understand how the demo scene is built.

Default Behaviors

Behaviors are used to make something happen in the process. Behaviors can be as simple as giving instructions and hints, making new objects visible, or animating an object in the scene. What they have in common is that something happens without requiring an intervention by the user. This section lists the default behaviors included in this package.

Guidance/Play Audio File

Description

The Play Audio File behavior plays an audio clip loaded from the Resources folder in your project's asset folder. VR Builder supports all audio file formats supported by Unity, which are:

- aif
- wav
- mp3
- ogg

Configuration

Resources path

Relative file path from the Resources folder. Omit the file extension (see example).

Example

File to be played: Assets/.../Resources/Sounds/click-sound.ogg

Default resource path: Sounds/click-sound

• Execution stages

By default, steps execute behaviors in the beginning, in their activation stage. This can be changed with the Execution stages dropdown menu:

- Before Step Execution: The step invokes the behavior during its activation.
- After Step Execution: Once a transition to another step has been selected and the current step starts deactivating, the behavior is invoked.
- Before and After Step Execution: Execution at activation and deactivation of a step.

Wait for completion

By default, the step waits for the audio file to finish. If you want the step to interrupt the audio in case the step is completed, uncheck this option.

Note: this might lead to an audio file not even being started.

Guidance/Play TextToSpeech Audio

Description

The Play TextToSpeech Audio behavior uses a synthesized voice to read text.

Configuration

The default Text-to-Speech language is set to 'English'. Check out our online tutorial to learn how to configure the Text-to-Speech Engine (TTS).

Text

Here you can input the text to be synthesized by the TTS engine.

Execution stages

By default, steps execute behaviors in the beginning, in their activation stage. This can be changed with the Execution stages dropdown menu:

- Before Step Execution: The step invokes the behavior during its activation.
- After Step Execution: Once a transition to another step has been selected and the current step starts deactivating, the behavior is invoked.
- Before and After Step Execution: Execution at activation and deactivation of a step.

Wait for completion

By default, the step waits for the audio file to finish. If you want the step to interrupt the audio in case the trainee completes the conditions, uncheck this option.

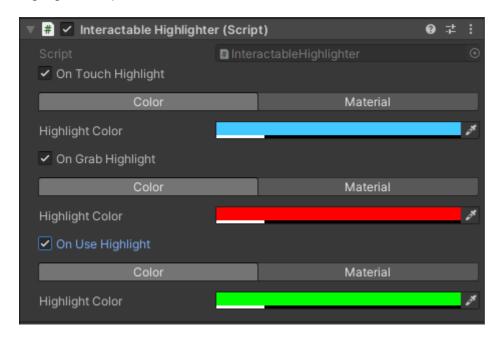
Note: this might lead to an audio file not even being started.

Guidance/Highlight Object

Description

The Highlight Object behavior visually highlights the selected object until the end of a step.

Select the highlighted Object in the Unity Hierarchy and open the Unity Inspector. Search for the *Interactable Highlighter Script*.



You can define the Color and Material for *On Touch Highlight*, *On Grab Highlight*, and *On Use Highlight*. The object will show the highlight color configured in the Highlight behavior by default. As soon as the object is touched it will change to the color configured in *On Touch Highlight*. The same happens when the object is grabbed or used. It will display the configured color in 'On Grab Highlight' or 'On Use Highlight'.

Configuration

Color

Color in which the target object will be highlighted. Colors are defined in the RGBA or HSV color channel. By configuring the alpha (A) value, highlights can be translucent.

Object

The Process Scene Object which should be highlighted.

Guidance/Audio Hint

Description

This composite behavior plays an audio file after a set time, for example to give the user some delayed hints.

Configuration

The Audio Hint behavior is a sequence combining a Delay and a Play Audio File behavior. Please refer to the documentation for the Behavior Sequence, the Delay behavior and the Play Audio File behavior.

Guidance/Spawn Confetti

Description

The Spawn Confetti behavior causes confetti to fall above the selected Object. It can be useful as visual feedback or celebration for completing a task successfully.

Configuration

Spawn Above User

If checked, the spawn position will be above the user rather than on the specified Process Scene Object.

Position Provider

Specifies where the confetti should spawn if not set to spawn above the user.

Confetti Machine Path

Path to the confetti machine prefab, relative to a Resources folder. Use the default one or point to your custom confetti machine.

Area Radius

Radius around the position provider in which confetti will be spawned.

• Duration

Duration of the visual effect in seconds.

Execution stages

By default, steps execute behaviors in the beginning, in their activation stage. This can be changed with the Execution stages dropdown menu:

- Before Step Execution: The step invokes the behavior during its activation.
- After Step Execution: Once a transition to another step has been selected and the current step starts deactivating, the behavior is invoked.
- Before and After Step Execution: Execution at activation and deactivation of a step.

Utility/Behavior Sequence

Description

The Behavior Sequence contains a list of child behaviors which will be activated one after another. A child behavior in the list will not be activated until the previous child behavior has finished its life cycle.

Configuration

Repeat

If checked, the behavior sequence restarts from the top of the child behavior list as soon as the life cycle of the last child behavior in the list has finished.

Child behaviors

List of all queued behaviors. Add behaviors to the list using the "Add Behavior" button.

Wait for completion

If checked, the behavior sequence will finish the life cycle of each child behavior in the list before it transitions to another step. Even when the "Repeat" option is enabled, the execution will transition to the next step after the child behavior list has been completed. Uncheck this option if you want to interrupt the sequence as soon as all conditions of a transition are fulfilled.

Utility/Delay

Description

The Delay behavior completes after the specified amount of time. This step will wait for the duration configured in Delay (in seconds), even when the user fulfills the required conditions to transition to the next step.

Configuration

• Delay (in seconds)

Configure the behavior's delay duration in seconds.

Example

Delay (in seconds) = 1.3

Utility/Set Parent

Description

The Set Parent behavior parents an Object to another one in the Unity hierarchy.

Configuration

Target

The Process Scene Object to be parented.

Parent

The new parent for the target object. Note this can be null, in which case the object will be unparented.

Snap to parent transform

If checked, the target object will snap to the same position and rotation as the parent object.

Environment/Disable Object

Description

The Disable Object behavior makes the selected Object invisible and non-interactive until it specifically is set back to "enabled" in a future step. Put into Unity terms, it deactivates the selected Game Object.

If you would like to make an object non-interactive while being visible, consider locking the object instead.

Configuration

Object

The Process Scene Object to be disabled.

Environment/Enable Object

Description

The Enable Object behavior makes the selected Object visible and interactive until it is specifically set back to "disabled" in a future step. Put into Unity terms, it activates the selected Game Object.

Configuration

Object

The Process Scene Object to be enabled.

Environment/Unsnap Object

Description

The Unsnap Object behavior unsnaps a snapped object from a snap zone. This can be useful in case the object needs to be further manipulated by the process.

Configuration

Either the object or the snap zone can be left null. This will result in either the object unsnapping from any snap zone it is in, or in the unsnapping of whatever object is snapped to the specified snap zone.

If both are specified, the unsnap will occur only if the specified object is snapped to the specified snap zone.

Object to unsnap

The Process Scene Object to unsnap.

Snap zone to unsnap

The Snap Zone from which the object will be unsnapped.

Animation/Move Object

Description

The Move Object behavior animates the Object to move and rotate (no scaling) to the position and rotation of the Final Position Provider in the time specified in the Duration (in seconds) parameter.

Note: If Object was affected by gravity before, it will continue to be affected after this behavior.

Configuration

Object

The Process Scene Object to be moved and rotated (no scaling).

• Final position provider

The Process Scene Object used as the position provider object. It should be placed at the destination position and rotation.

Animation duration (in seconds)

Time in seconds the animation takes to move and rotate Object to the Final position provider.

Example

Duration (in seconds) = 1.3

Default Conditions

Conditions are used to determine which transition is used to exit a step. Transitions are evaluated top to bottom, and the first valid one will be selected. To be valid means to have only fulfilled conditions or no conditions at all. A condition usually requires the user's intervention, for example grabbing an object. However this is not always the case: conditions like the timeout condition will trigger regardless of the user's activity. There may also be cases in which other factors in the environment determine if a condition is fulfilled. Conditions need to be active in order to be fulfilled. As soon as a step is active, all containing Conditions are active as well.

Environment/Move Object in Collider

Description

The Move Object in Collider condition is fulfilled when the Object is within the specified Collider for the required amount of time (Required seconds inside) while this condition is active.

Configuration

Object

The Process Scene Object to move. If the object needs to be grabbed, it needs to have the Grabbable Property and a collider component configured. The collider defines the area where the user can grab this object.

Collider

The Process Scene Object with the destination collider. Make sure that a collider is present and that the option Is Trigger is enabled.

Required seconds inside

Set the time in seconds that the Object should stay inside the Collider.

Environment/Object Nearby

Description

The Object Nearby condition is fulfilled when the Object is within the specified Range of a Reference object.

Configuration

Object

The Process Scene Object that should be in the radius of the Reference Object. Make sure you add at least the Process Scene Object component to this game object in the Unity Inspector.

Reference Object

The Process Scene Object from which you want to measure the distance.

Range

In this field, you can set the maximum distance between the *Object* and the *Reference object* required to fulfill this condition.

Required seconds inside

In this field, you can set the time in seconds the Object should stay within the radius Range of the Reference Object.

Interaction/Grab Object

Description

The Grab Object condition is fulfilled when the user grabs the <code>Object</code>. The condition is also fulfilled if the user already grabbed the Object before the step was activated, that is, if the user is already holding the specified object.

Configuration

Object

The Process Scene Object to grab. The object needs to have the Grabbable Property and a collider component configured. The collider defines the area where the user can grab this object.

Interaction/Release Object

Description

The Release Object condition is fulfilled when the Object is released by the user's controller. If the user is not already holding the specified object in hand while this condition is active, it is fulfilled immediately.

Configuration

Object

The Process Scene Object to release. The object needs to have the Grabbable Property and a collider component configured.

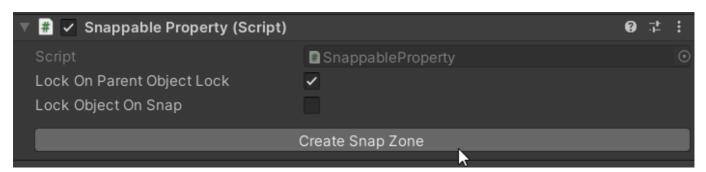
Interaction/Snap Object

Description

The Snap Object condition is fulfilled when the Object is released into the Zone to snap into, which means the collider of the Object and collider of the Zone overlap. Adapt the collider size of the snap zone to increase or decrease the area where the user can release the Object. Increasing the collider size of the snap zone decreases the required *snap* precision and simplifies the user's interaction in VR. After the user releases the Object, this is moved to the snap zone's SnapPoint. To adjust this position, change the position of the SnapPoint child object of the Zone to snap into object.

Snap Zone Generator

For any snappable object you can generate a snap zone that can snap exactly this object and can be used as a Zone to snap into. To do so, navigate to the Snappable Property in Unity's Inspector and click on the button Create Snap Zone.



Manual Snap Zone Creation

Instead of the automatic generation as described above, you can do those steps also manually. Please refer to available documentation on the XRSocketInteractor from Unity or related sources. You can also make

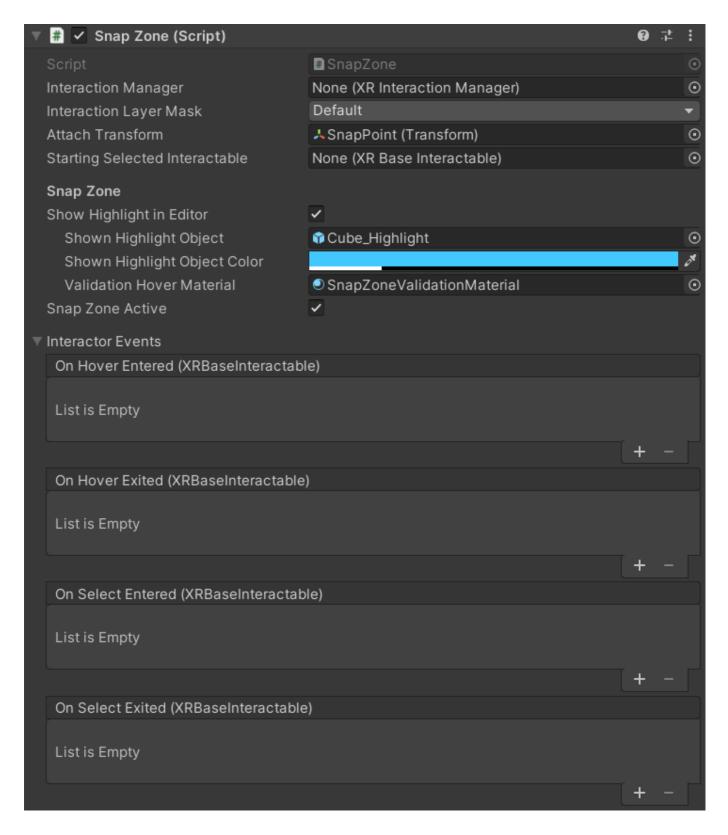
changes to the automatically created snap zone to adapt it to your needs. Please note that these changes might impact the process logic.

Feed Forward for Snap Zones

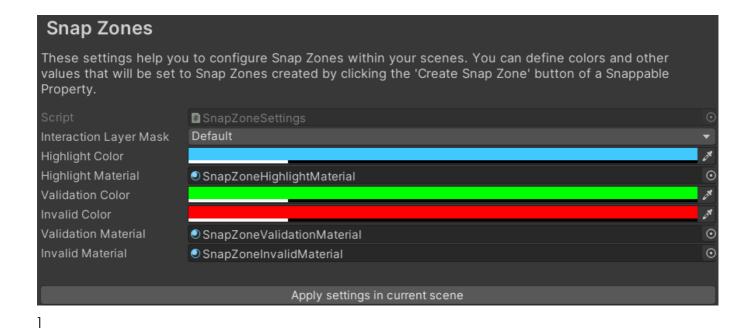
Snap zones are restricted to which objects can be snapped. This means every object can be valid (i.e. it can be snapped to this zone) or invalid (it can not be snapped to this zone) for a snap zone. In case you are moving a valid object into a zone, the snap zone color changes to 'Validation Color' (green), providing the user in VR with positive feedback. In case you are moving an invalid object into a zone, the snap zone color changes to 'Invalid Color' (red), giving the user the feedback that this is the wrong object for this zone. You can modify the colors and materials to be used in the Snap Zones parameters and settings.

Snap Zone Parameters and Settings

To change the highlight color or validation hover material of a dedicated snap zone, navigate to the snap zone object in the Unity Inspector. You will find the Snap Zone Parameters and Settings in the script Snap Zone.



To change the colors and materials of all snap zones in the scene, select them in the VR Builder snap zone settings and press 'Apply settings in current scene'.



The snap zone settings can be found in the project settings in tab VR Builder > Settings > Snap Zones.

Configuration

• Object

The Process Scene Object to place (snap). The object needs to have the Snappable Property and a collider component configured.

Zone to snap into

This field contains the Process Scene Object where the Object is required to be snapped. Make sure you added the Snap Zone Property component to the snap zone game object in the Unity Inspector. Besides, the object must have a collider component with the Is Trigger property enabled.

Interaction/Touch Object

Description

The Touch Object condition is fulfilled when the Object is touched by the user's controller. If a user is already touching the specified object while this condition is active, this condition is fulfilled immediately.

Configuration

Object

The Process Scene Object to be touched. The object needs to have the Touchable Property and a collider component configured.

Interaction/Use Object

Description

The Use Object condition is fulfilled when the Object is used by pressing the *Use* button of the controller while being touched or grabbed.

Configuration

Object

The Process Scene Object that is required to be used. The Object needs to have the Usable Property and a collider component configured.

Utility/Timeout

Description

The Timeout condition is fulfilled when the time specified in Wait (in seconds) has elapsed. This can make sense as a "fallback" condition. For example, if the user does not complete condition X in the allotted amount of time, the timeout condition will trigger leading to a different step with different consequences.

Configuration

• Wait (in seconds)

Set the time in seconds that should elapse before this condition is fulfilled.

VR User/Teleport

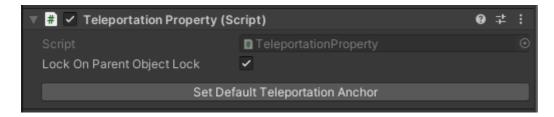
Description

The Teleport condition is fulfilled when the user teleports to the referenced Teleportation Point. Previous teleportation actions made into the Teleportation Point are not considered.

The provided Teleportation Property is based on the Unity XR Interaction Toolkit's Teleportation Anchor. For further reference, please check out the XR Interaction Toolkit documentation.

Configuring the Teleportation Point

The Teleportation Property can be set as a **Default Teleportation Anchor** by clicking on the Set Default Teleportation Anchor button. You can find it when selecting the Teleportation Point and viewing it in the Unity Inspector.



This will configure the attached Teleportation Anchor. It will provide a visual element in the Unity Editor that helps placing the Teleportation Point in the scene. This visual element will also be shown in the virtual world during training execution to guide the user.

Configuration

• Teleportation Point

The Teleportation Property where the user should teleport.

Online Documentation

We offer a constantly expanding list of guides and tutorials on our website. We encourage you to check them out to improve your VR Builder skills.

If this is your first time with VR Builder, you should start from the Workflow Editor and Step Inspector tutorials, which explain the basics of working with VR Builder.

In addition, you might also want to check out the guides on how to build standalone VR Builder apps on the Oculus Quest or Pico Neo 3.

You can also check out some guides on the more advanced interactions, like the series on snap zones.

Lastly, there are some step-by-step tutorials explaining how to work with our latest paid add-ons. Even if you don't intend to buy the relevant content, they can provide a good overview on how to build a functional process with VR Builder from scratch.

Acknowledgements

VR Builder is based on the open source edition of the Innoactive Creator. While Innoactive helps enterprises to scale VR training, we adopted this tool to provide value for smaller content creators looking to streamline their VR development processes.

Like Innoactive, we believe in the value of open source and will continue to support this approach together with them and the open source community.

As VR Builder shares the same DNA as the Innoactive Creator, it can be useful check the documentation for the Innoactive Creator, the majority of which might be applicable to VR Builder as well.

Contact and Support

Join our official Discord server for quick support from the developer and fellow users. Suggest and vote on new ideas to influence the future of the VR Builder.

Make sure to review VR Builder on the Unity Asset Store if you like it. This will help us sustain the development of VR Builder.

If you have any issues, please contact contact@mindport.co. We'd love to get your feedback, both positive and constructive. By sharing your feedback you help us improve - thank you in advance! Let's build something extraordinary!

You can also visit our website at mindport.co.