# Reality Connect User Guide

Version 1.1

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**Created on**

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# 1 Introduction

Reality Connect enhances the virtual studio experience with more realism using immersive real-time talent shadow and reflection capabilities.

## 1.1 Related Documents

- Viz Engine
- AI Terminal

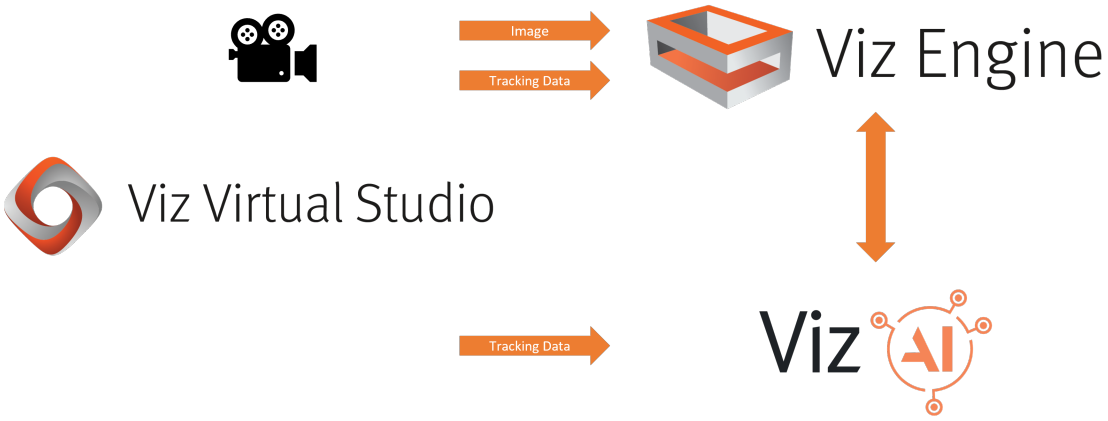
For more information about all of the Vizrt products, visit:

- www.vizrt.com
- Vizrt Documentation Center
- Vizrt Training Center
- Vizrt Forum

## 1.2 Feedback And Suggestions

We encourage feedback on our products and documentation. Please contact your local Vizrt customer support team at www.vizrt.com.

## 1.3 System Overview




Reality Connect is a feature configured and controlled by the *Vizrt AI Terminal*. It extends the *Viz Virtual Studio* solution and integrates both with *Viz Engine* and *Viz Virtual Studio (Tracking Hub)* to track one or multiple talents using AI. Viz Engine can then be configured to use the talent tracking data to render effects such as talent shadows or reflections.

> **Note:** Reality Connect needs to run on the same computer as Viz Engine.

## 1.4 System Requirements

### 1.4.1 General

| | |
|---|---|
| **OS** | Windows 10 (64-bit) |
| **Browser** | Google Chrome |
| | Firefox |
| | Microsoft Edge |

### 1.4.2 Hardware

| | Minimal | Recommended |
|---|---|---|
| **Box** | HP Z4 | HP Z8 |
| | | Dell R7920 |
| **Graphics Card** | NVIDIA RTX A5000 | NVIDIA RTX A6000 |
| | | 2x NVIDIA RTX A5000 |

**Note:** The performance is strongly influenced by the complexity of the virtual studio scene. Reality Connect does offer different modes to optimize for best performance or best quality. A strong graphics card such as the NVIDIA RTX A6000 is strongly recommended to achieve optimal quality. Alternatively, the load can be distributed among two graphic cards.

### 1.4.3 Software

- Viz Engine (5.1 or later)
- Viz Virtual Studio / Tracking Hub (1.7 or later)
- AI Terminal (1.1 or later)
- AI Core (1.6 or later)

# 2 Installation

## 2.1 AI Terminal

Install AI Terminal 1.1 or newer. The installation is explained further in the *AI Terminal User Guide*.

## 2.2 Reality Connect

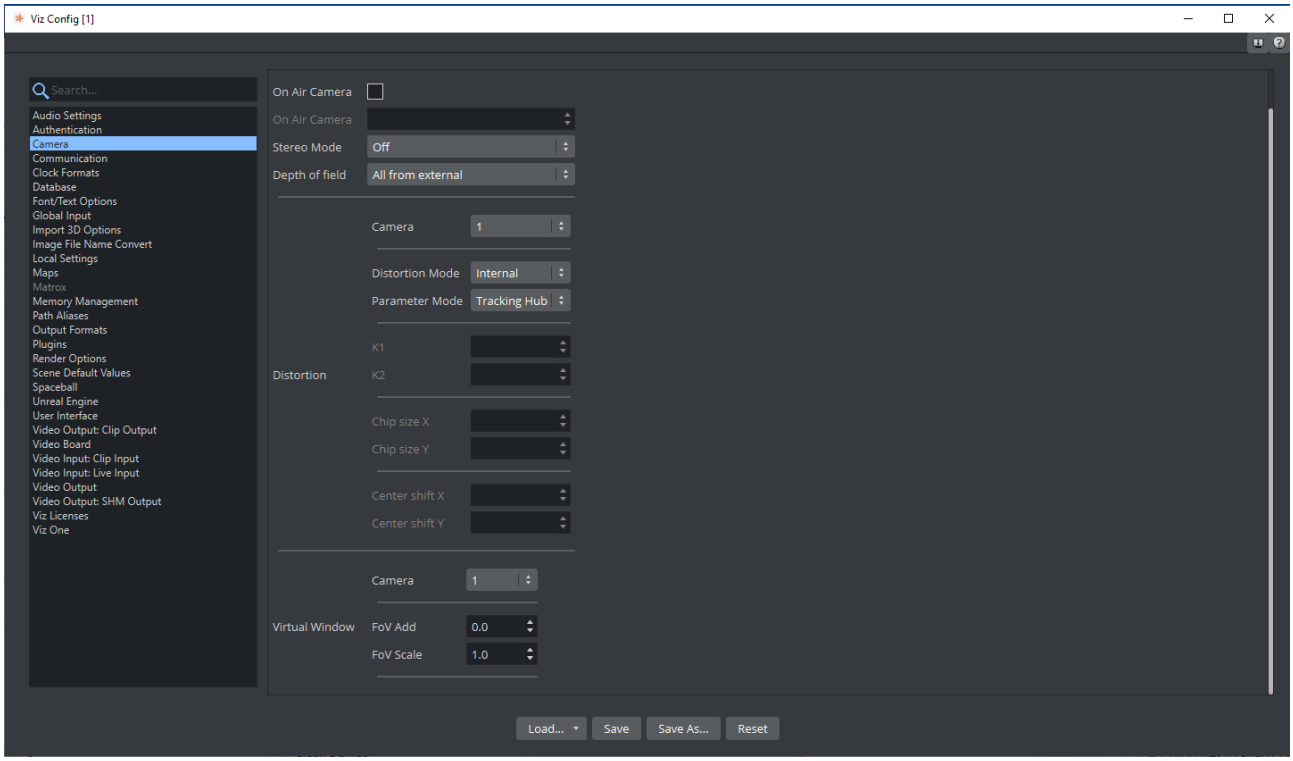
Launch *VizAiPoseTrackerPlugin-*.msi* and follow the instructions.

# 3 Viz Engine Configuration

The Viz Engine configuration needs slight adaptions for Reality Connect. These are described below:


- Camera
- Communication
- Unreal Engine


## 3.1 Camera




### 3.1.1 Distortion Mode

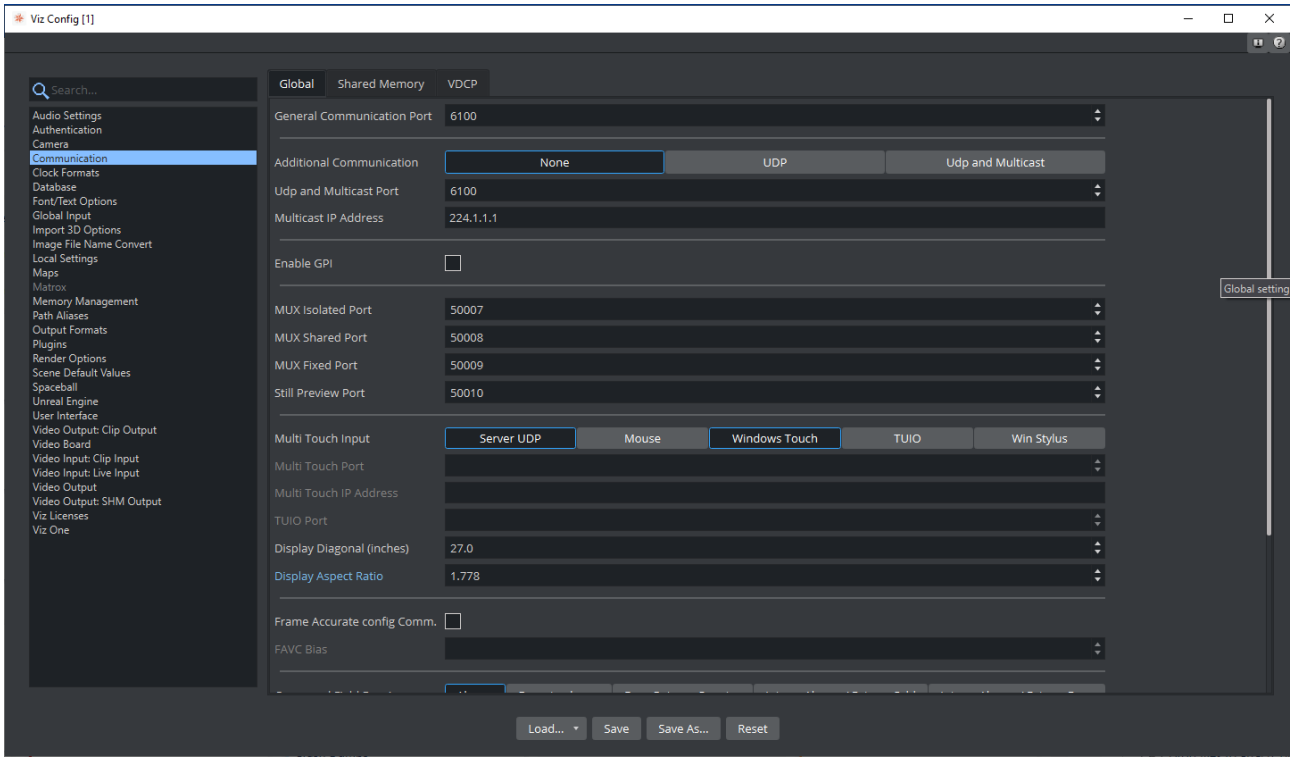
Set to *Internal*.

### 3.1.2 Parameter Mode

Set to *Tracking Hub*.

## 3.2 Communication

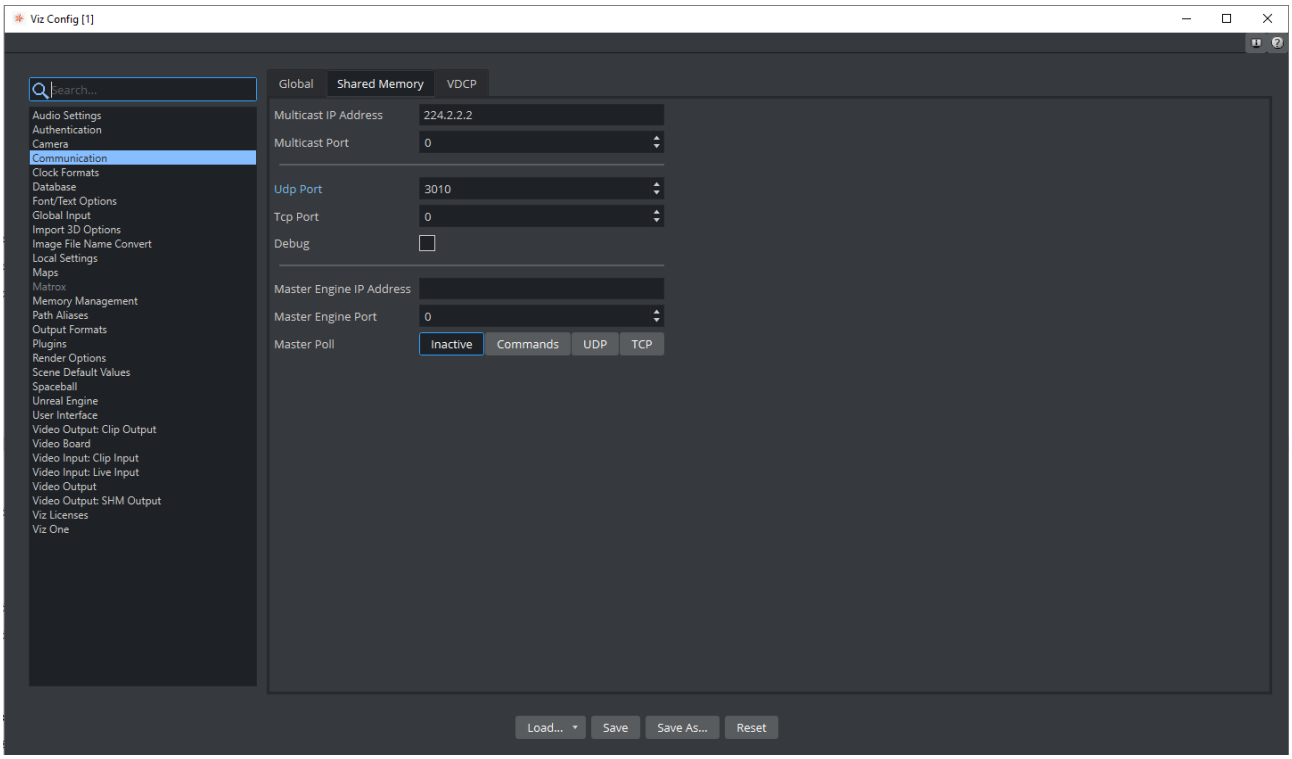
### 3.2.1 Global




#### General Communication Port

Set to an available port other than `0`. This port is required during the Tool Configuration.

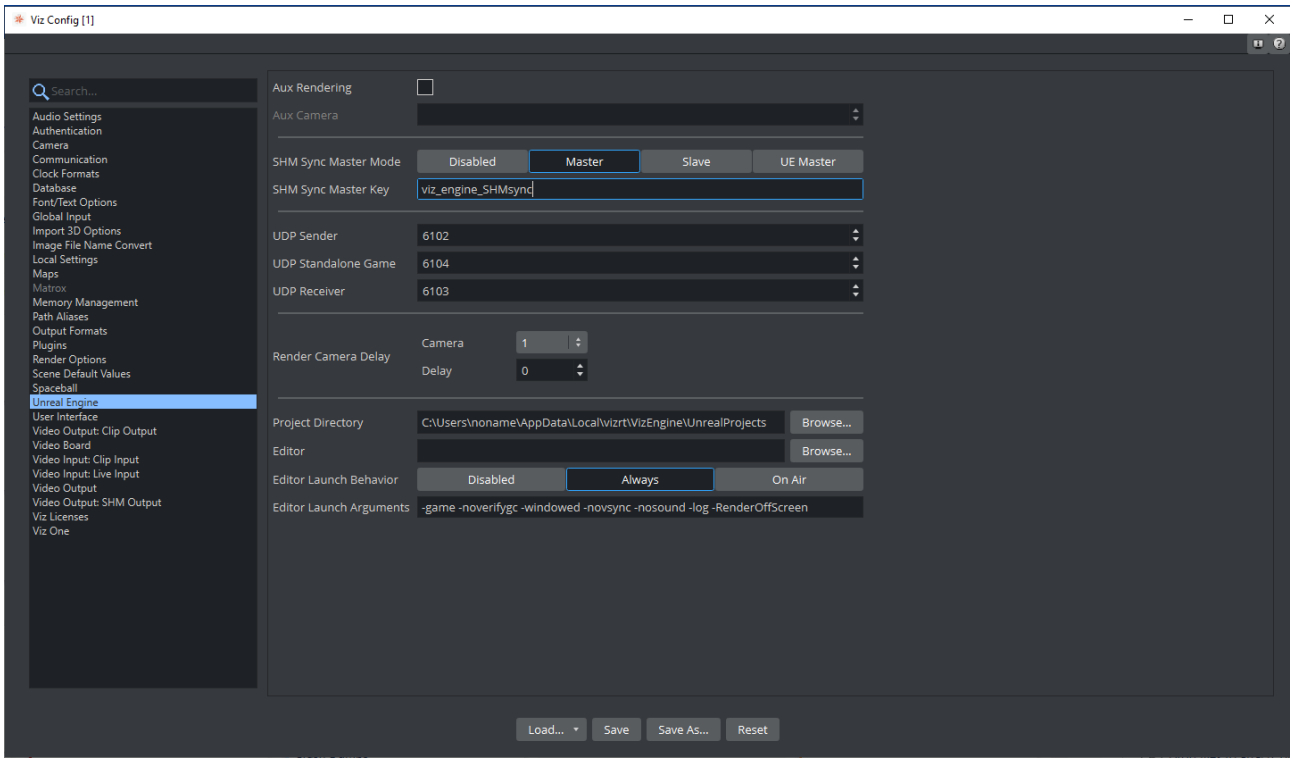
## 3.2.2 Shared Memory




### UDP Port

Set to an available port other than `0`.

## 3.3 Unreal Engine




### 3.3.1 SHM Sync Master Mode

Set to *Master*.

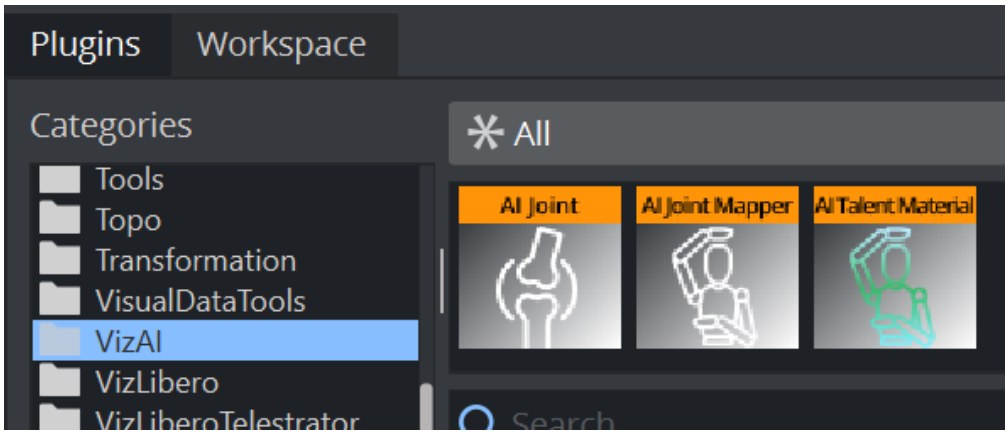
### 3.3.2 SHM Sync Master Key

Specify a non-empty name. This name is required during the Tool Configuration.

# 4 Viz Engine Scene Design

## 4.1 Viz AI Plug-Ins

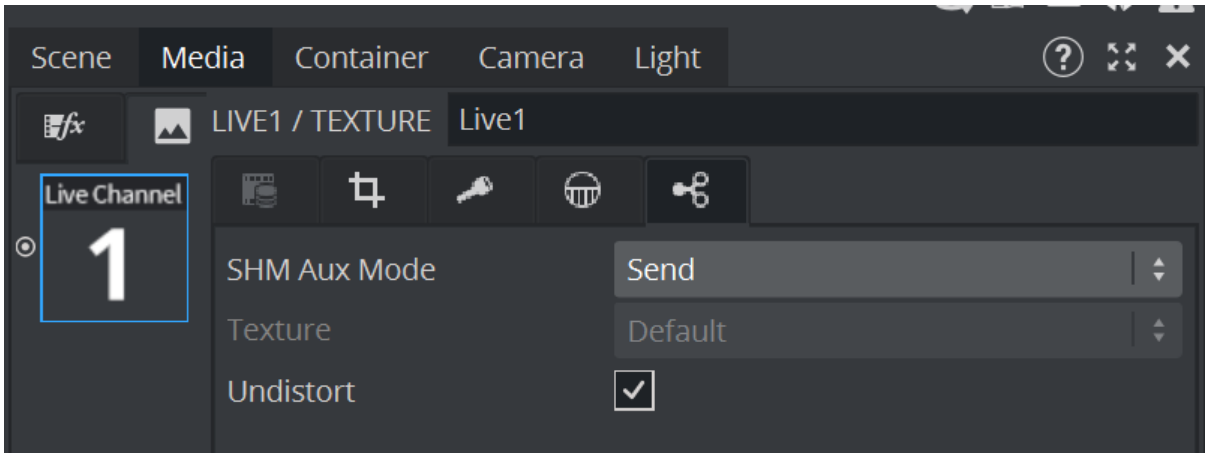
This section requires the Viz AI plug-ins to be installed on the system. Refer to the *AI Terminal User Guide* for installation instructions.




- **AI Joint:** Specifies and controls a skeleton joint.
- **AI Joint Mapper:** Specifies and controls the root container of a talent and maps it with Reality Connect.
- **AI Talent Material:** Use the input video as texture for the talent models to enable reflection effects.

## 4.2 Texture Sharing

Share the video input with Reality Connect with these settings in the **Media** tab.

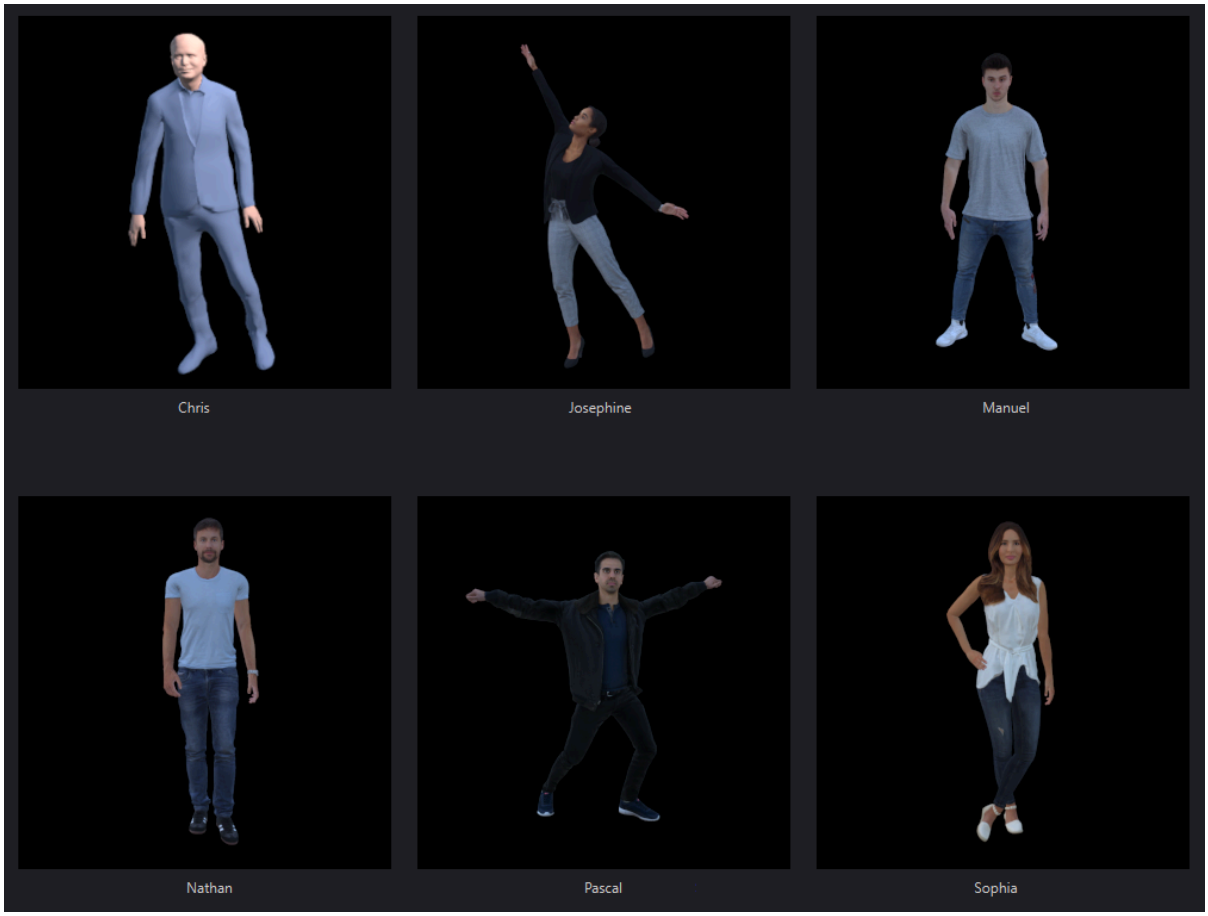



- Set **SHM Aux Mode** to *Send*.
- Check the **Undistort** box.

## 4.3 Preset Models

Preset models are rigged models that have already been enhanced and configured with the Reality Connect joint plug-ins, **AI Joint**, **AI Joint Mapper** and **AI Talent Material**. The preset models available with this release are shown in the image below.

Read through the Model Adjustments and Create a New Model sections to learn how to configure your own models for Reality Connect.

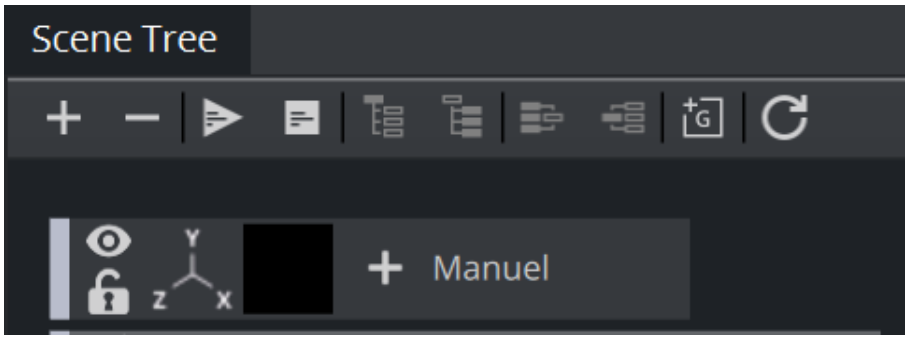



The following table lists the origin of the preset models before porting them to the Viz Engine and applying the steps listed in Model Adjustments.

| Name | Link | Author | License |
|---|---|---|---|
| Chris | | Vizrt | |
| Nathan | https://sketchfab.com/3d-models/nathan-animated-003-walking-3d-man-143a2b1ea5eb4385ae90a73657aca3bc | https://renderpeople.com/ | CC Attribution |

| Name | Link | Author | License |
|---|---|---|---|
| Sophia | https://sketchfab.com/3d-models/sophia-animated-003-animated-3d-woman-dc448c3be0e74f96a55fb475a13433cf | https://renderpeople.com/ | CC Attribution |
| Josephine | https://sketchfab.com/3d-models/carla-rigged-001-rigged-3d-business-women-acf520f450d14dd799f98a6fede3edf5 | https://renderpeople.com/ | CC Attribution |
| Manuel | https://sketchfab.com/3d-models/manuel-animated-001-3d-dancing-man-e65e0fef4e0743868c8d5bff36d61116 | https://renderpeople.com/ | CC Attribution |
| Pascal | https://sketchfab.com/3d-models/facial-body-animated-party-m-0001-actorcore-aecb1b0c293a4185a91a532e635f3e6d | https://www.reallusion.com/ | CC Attribution |

The preset models are provided as Geometries and can be added to a scene by a drag and drop operation.

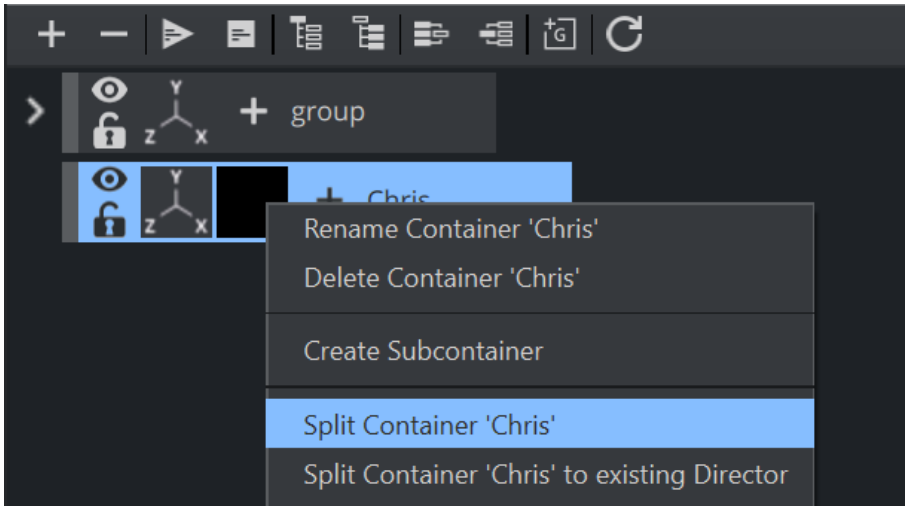




Make sure that the position and the rotation of the new container are set to *(0,0,0)*. At this point, the imported geometry is automatically animated from a real talent detected by a running Reality Connect application.

---

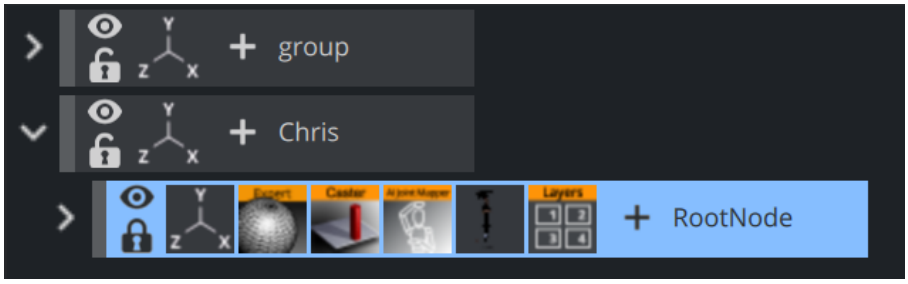
## 4.4 Model Configuration

Split (right-click) the container to obtain the full tree including all subcontainers.

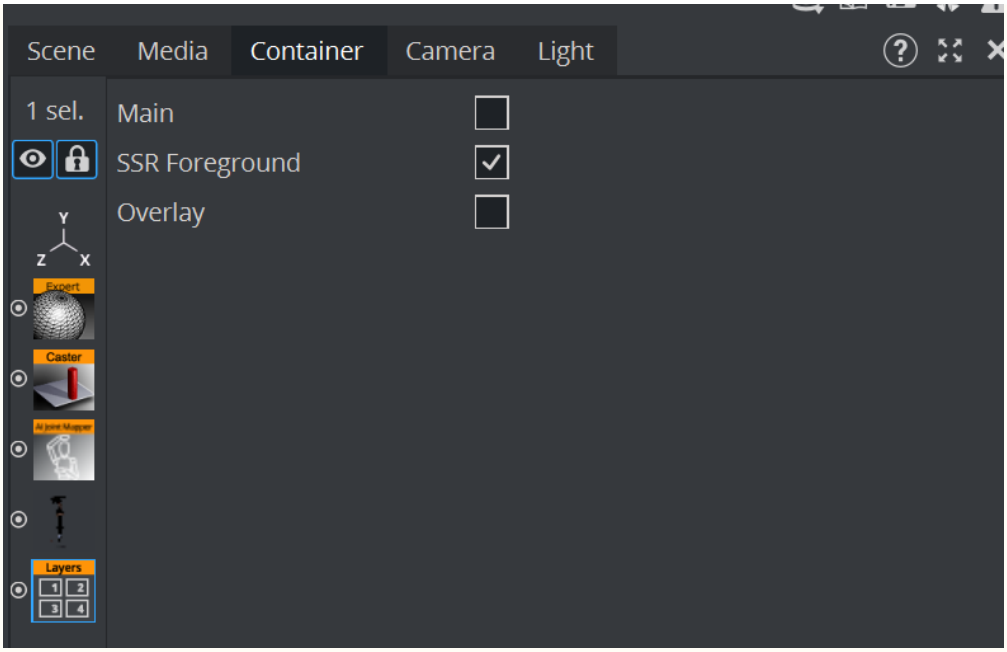



This creates access to a *RootNode* container with the following plug-ins:

- Expert.
- Shadow Caster.
- AI Joint Mapper.
- AI Talent Material.
- Layers.

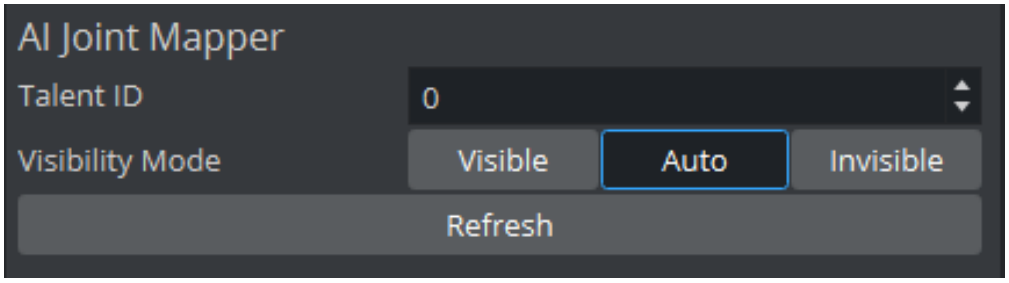



**Note:** For improved rendering quality, switch to **SSR Foreground** in the Layers plug-in.



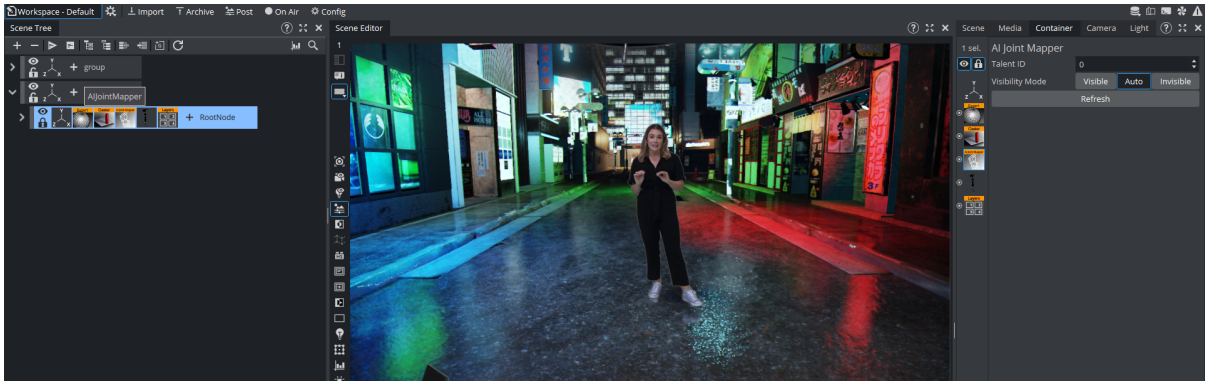

### 4.4.1 Talent Mapping

The **AI Joint Mapper** plug-in comes with the following options:




- **Talent ID:** If multiple talents are tracked, each model needs a different Talent ID (0 - 7).
- **Visibility Mode:** During a production this should always be set to *Auto*.
  - **Visible:** The model is always visible (also when Reality Connect is not running).
  - **Auto:** Reality Connect automatically sets the visibility of the model when a talent appears or leaves the scene.
  - **Invisible:** The model is always invisible.
- **Refresh:** Recalculates the internal tree structure. This is required on manual change or creation of a talent model.

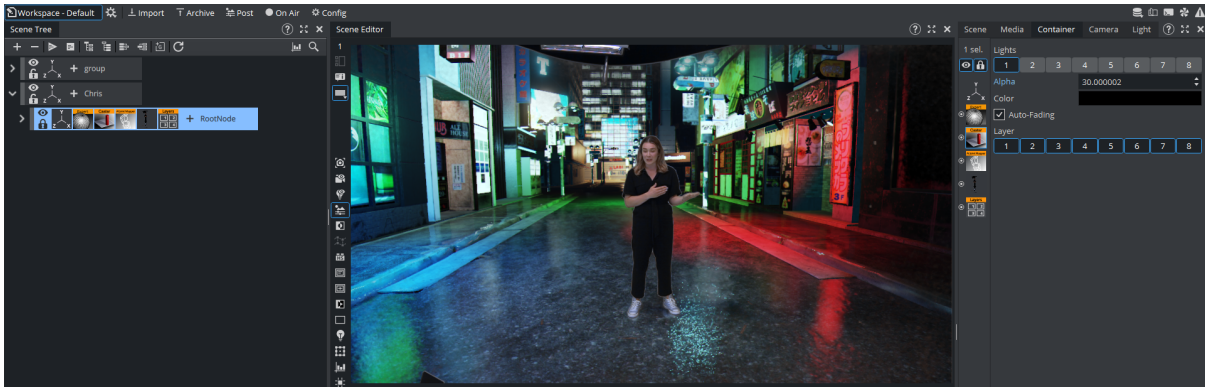
⚠ **Note:** Each talent detected by Reality Connect keeps an internal Talent ID between 0 and 7. This ID is lost when the talent leaves the scene and there is no guarantee the same ID is reapplied to the same talent after the talent re-enters the scene.




### 4.4.2 Shadow Configuration

Enable/disable the **Shadow Caster** plug-in to turn on/off shadows projected from the talent.

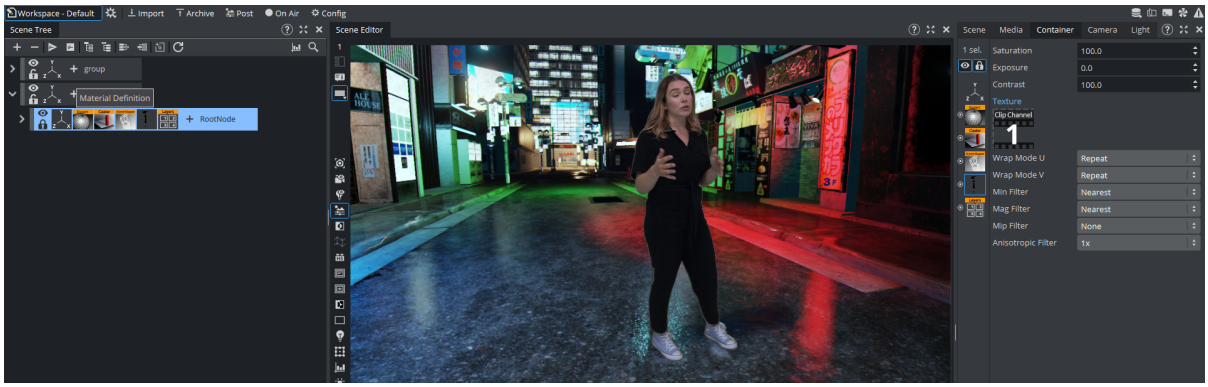
> **Note:** This requires the **Shadow Receiver** plug-in to be enabled on surfaces in the virtual scene where shadows should be projected to.



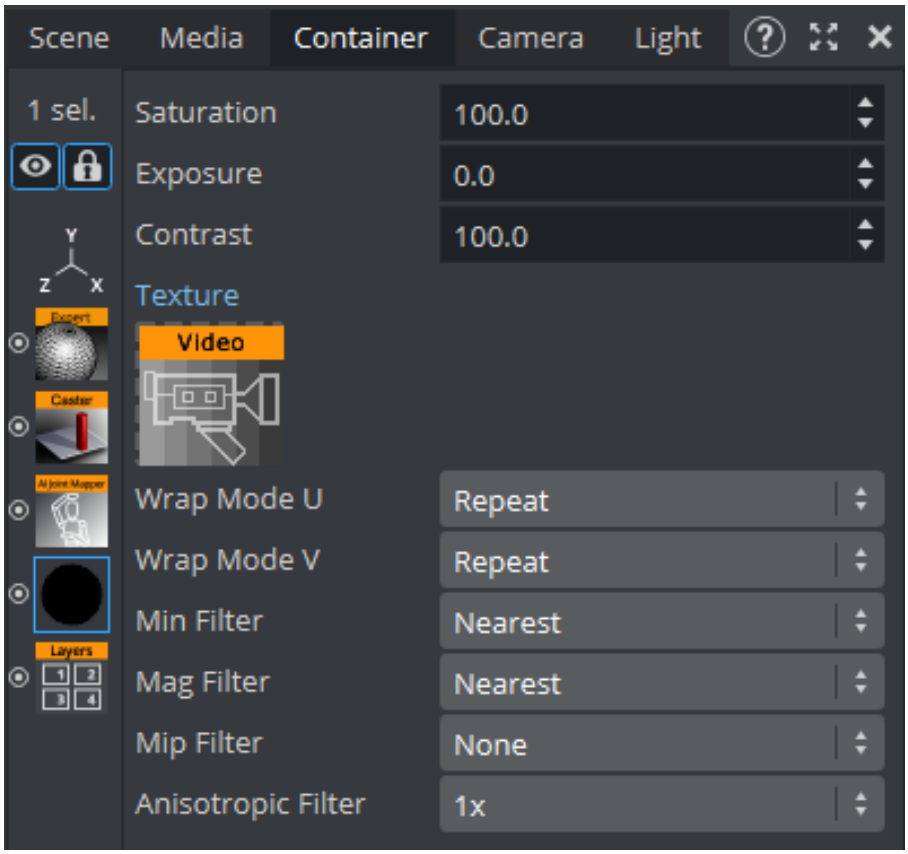

### 4.4.3 Reflection Configuration

Enable/disable the **AI Talent Material** plug-in to turn on/off reflections from the talent.

> **Note:** This requires the materials in the virtual studio to be configured as reflective.



Use the following options of the **AI Talent Material** plug-in to configure the reflection effect.




- **Saturation:** Controls the reflection's color saturation.
- **Exposure:** Controls the reflection's color exposure.
- **Contrast:** Controls the reflection's color contrast.
- **Texture:** Specify the video source (for example, *LIVE1*) to texture the talent with. This should be set to the same video source configured as input for Reality Connect.

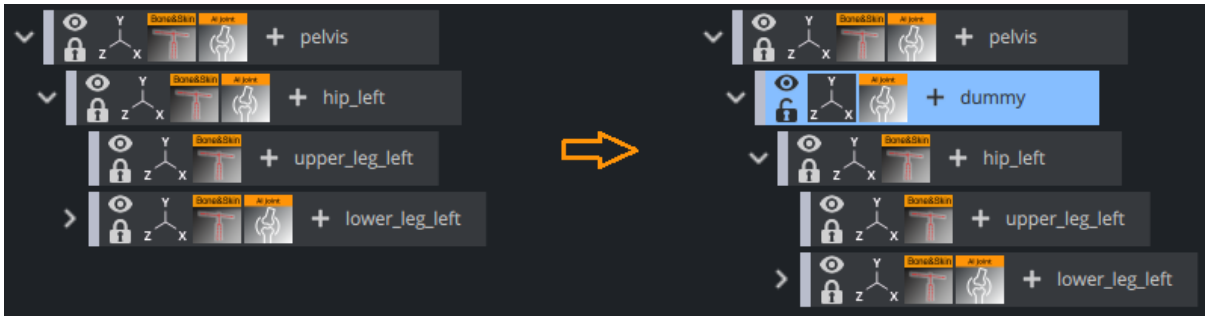
---

## 4.5 Model Adjustments

### 4.5.1 Bone Offset

For advanced use cases, models can be customized to better fit the real talent. Expand the model container to visualize the full tree.

The bones controlled by Reality Connect have the **AI Joint** plug-in attached to it, and the bones that animate the geometry model have the **Bone&Skin** plug-in attached to it. If the two plug-ins are on the same bone, the bone is directly controlled by Reality Connect. Separate the two to introduce a position or rotation offset.




To add an offset to a bone:

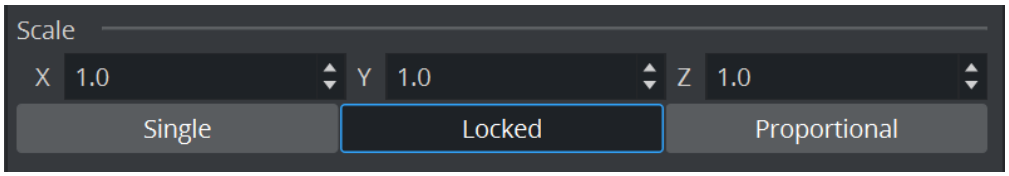
- Create a new parent container.
- Move the **AI Joint** plug-in to the parent container.
- Click the **Refresh** button of the **AI Joint Mapper** plug-in.
- Set the desired position and rotation offset in the child container.

### 4.5.2 Bone Scaling

To fit the size of a model better to a specific talent, the **Scale** parameter of containers holding an AI Joint plug-in can be used to adjust individual bones.

> **Note:** Scaling a certain bone scales all of its children equally (for example scaling the left hip scales the entire left leg accordingly while scaling the pelvis scales the entire model).

The Reality Connect only supports the Scaling Modes **Locked** and **Proportional**.



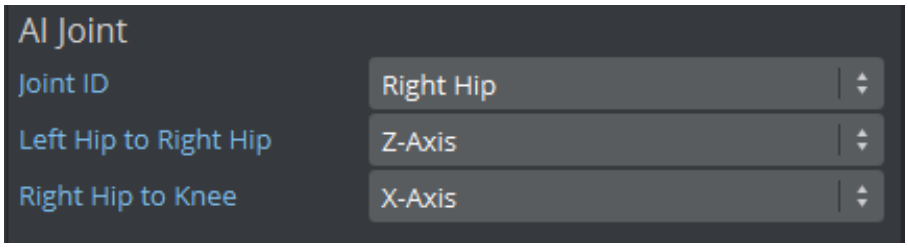

## 4.6 Create A New Model

This section contains additional information for advanced users that create their own models.

### 4.6.1 Talent Mapping

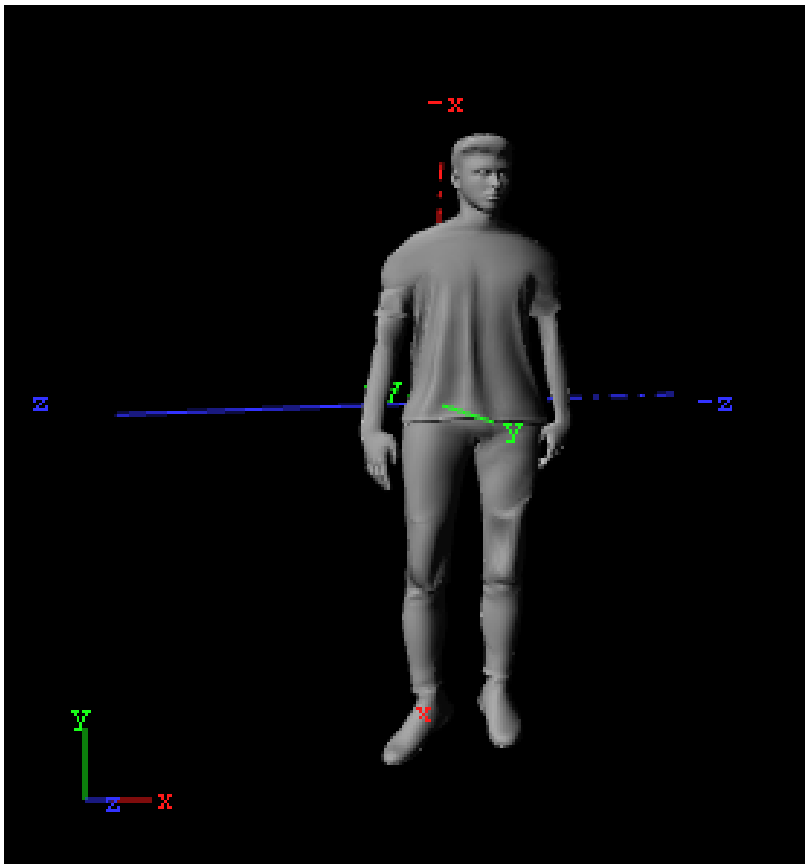
Add the **AI Joint Mapper** plug-in to the root container. Add the **AI Joint** plug-in to each bone container that should be animated. Remember to click the **Refresh** button of the **AI Joint Mapper** plug-in to apply changes of the tree structure or **AI Joint** plug-ins.

### 4.6.2 Joint Mapping



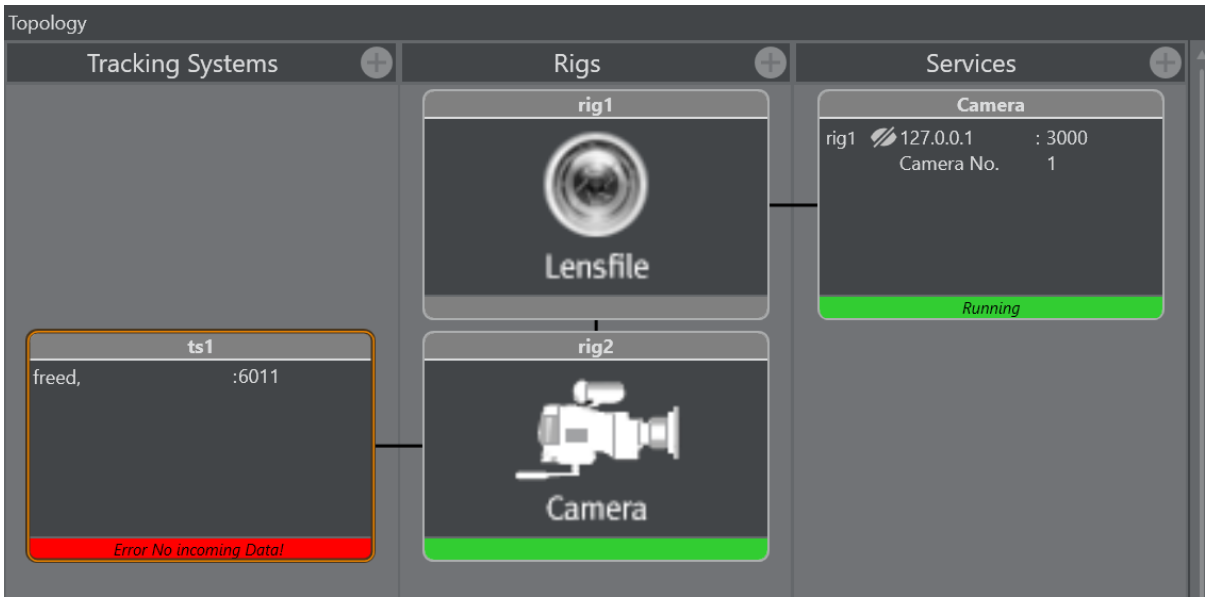

- **Joint ID:** The joint the container / bone is referring to.
- **Axes:** The Joint axes used to calculate the rotation of the joint.

> **Note:** To identify the correct axes, check the local coordinate system of the container and set the axes for the specified directions accordingly. For the right hip joint in the talent below the the z-axis points into **Left Hip to Right Hip** direction and the x-axis into **Right Hip to Knee** direction.



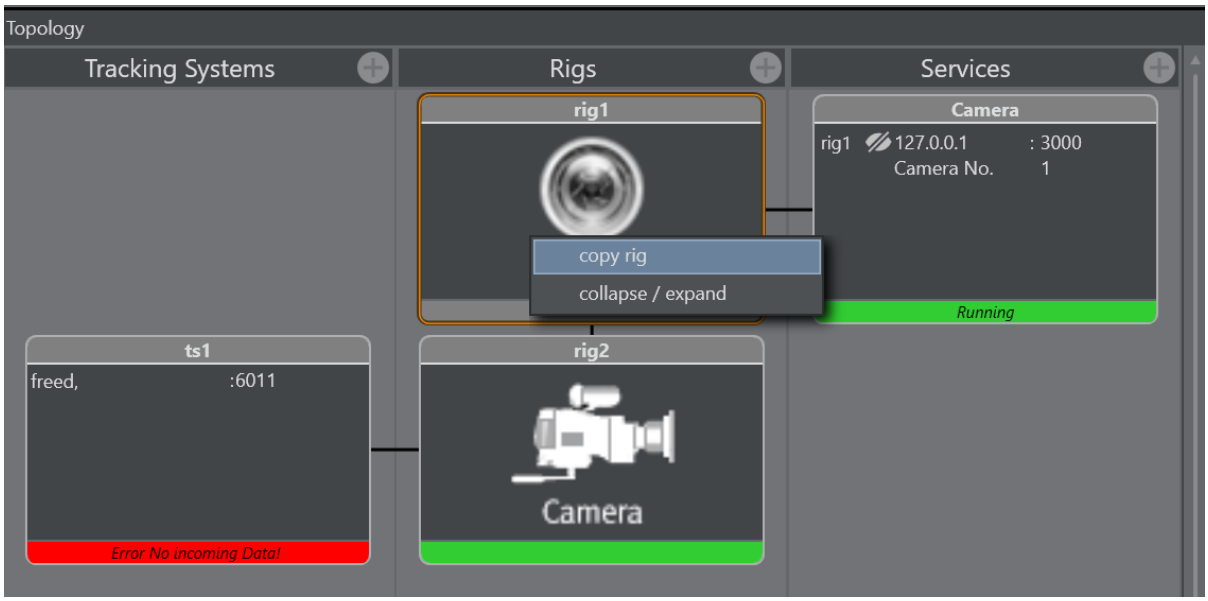
# 5 Tracking Hub Configuration

Reality Connect requires camera data to function properly. This implies a few changes to the regular Tracking Hub configuration. For this guide, let us assume the following configuration.



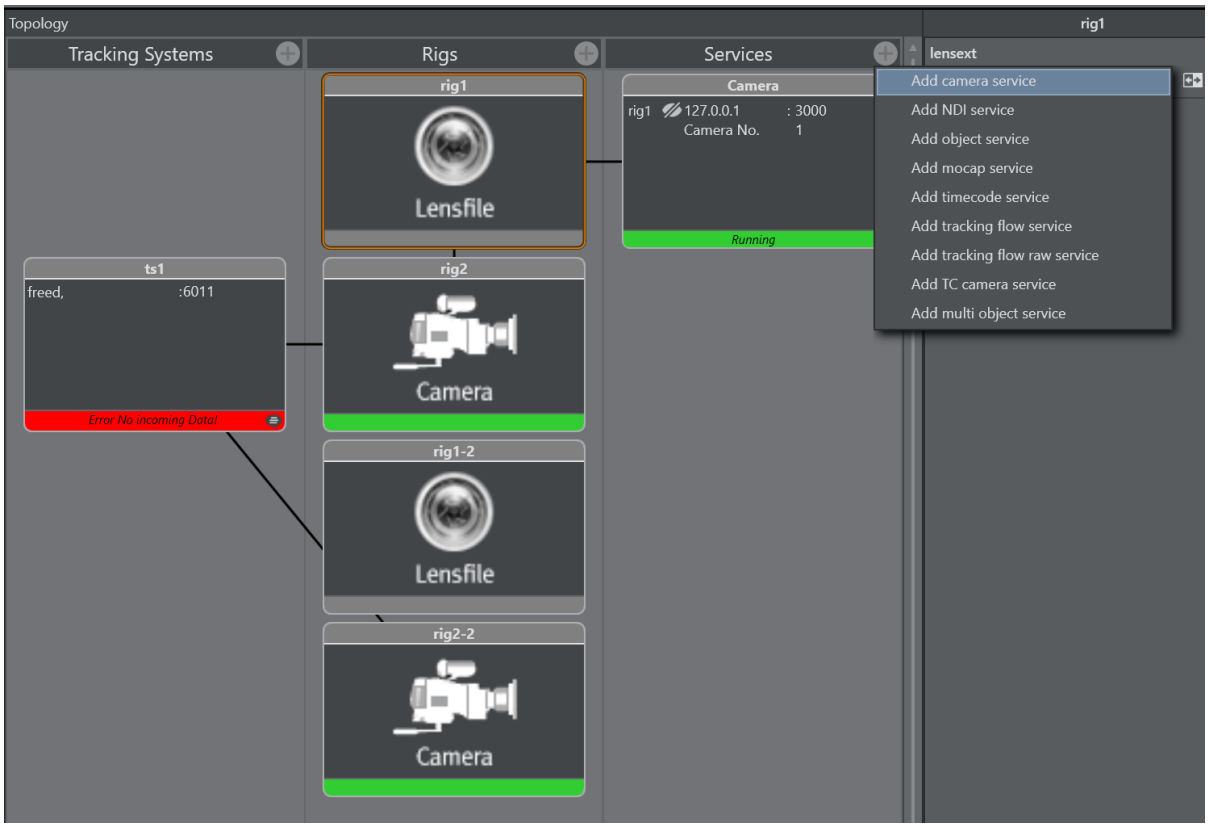

## 5.1 Copy Rig

Copy the last rig in the chain, connected to the camera service, which is usually the *Lensfile*.

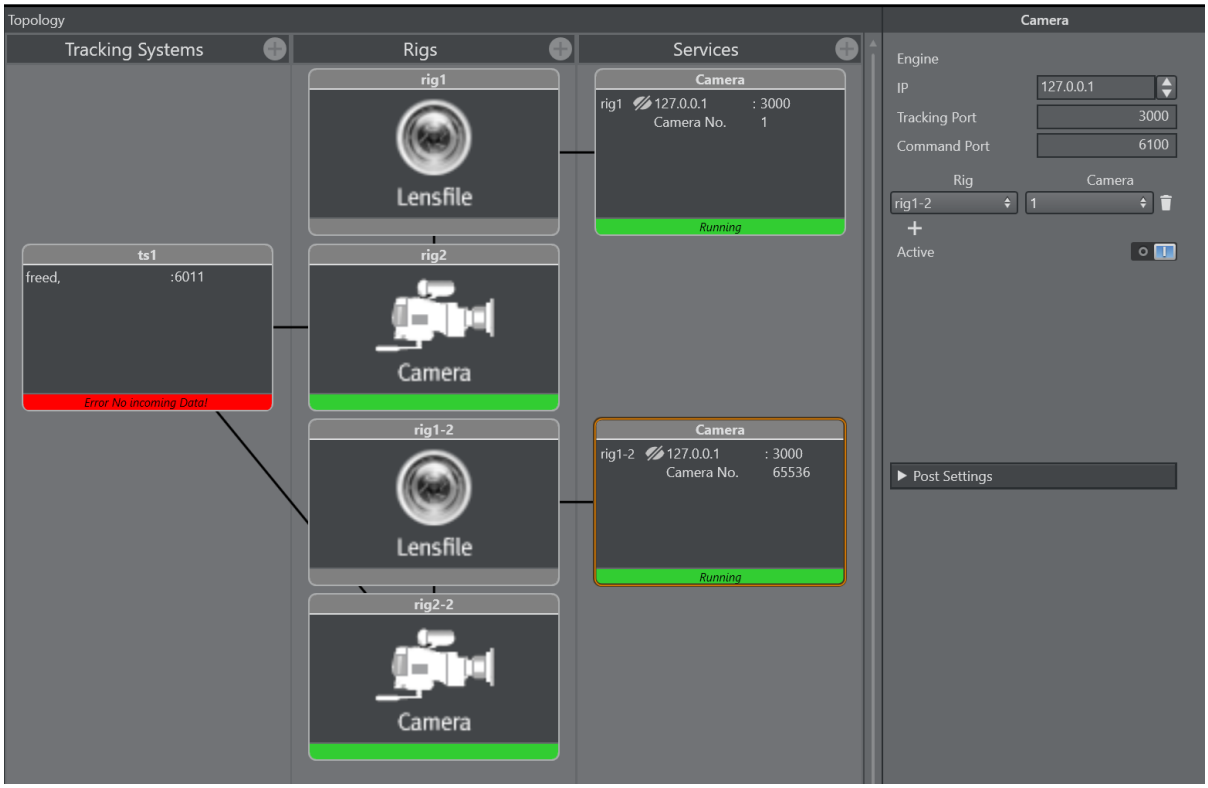


## 5.2 Add Camera Service

Add a second camera service.




Connect the second camera service with the previously created copy of the rig.

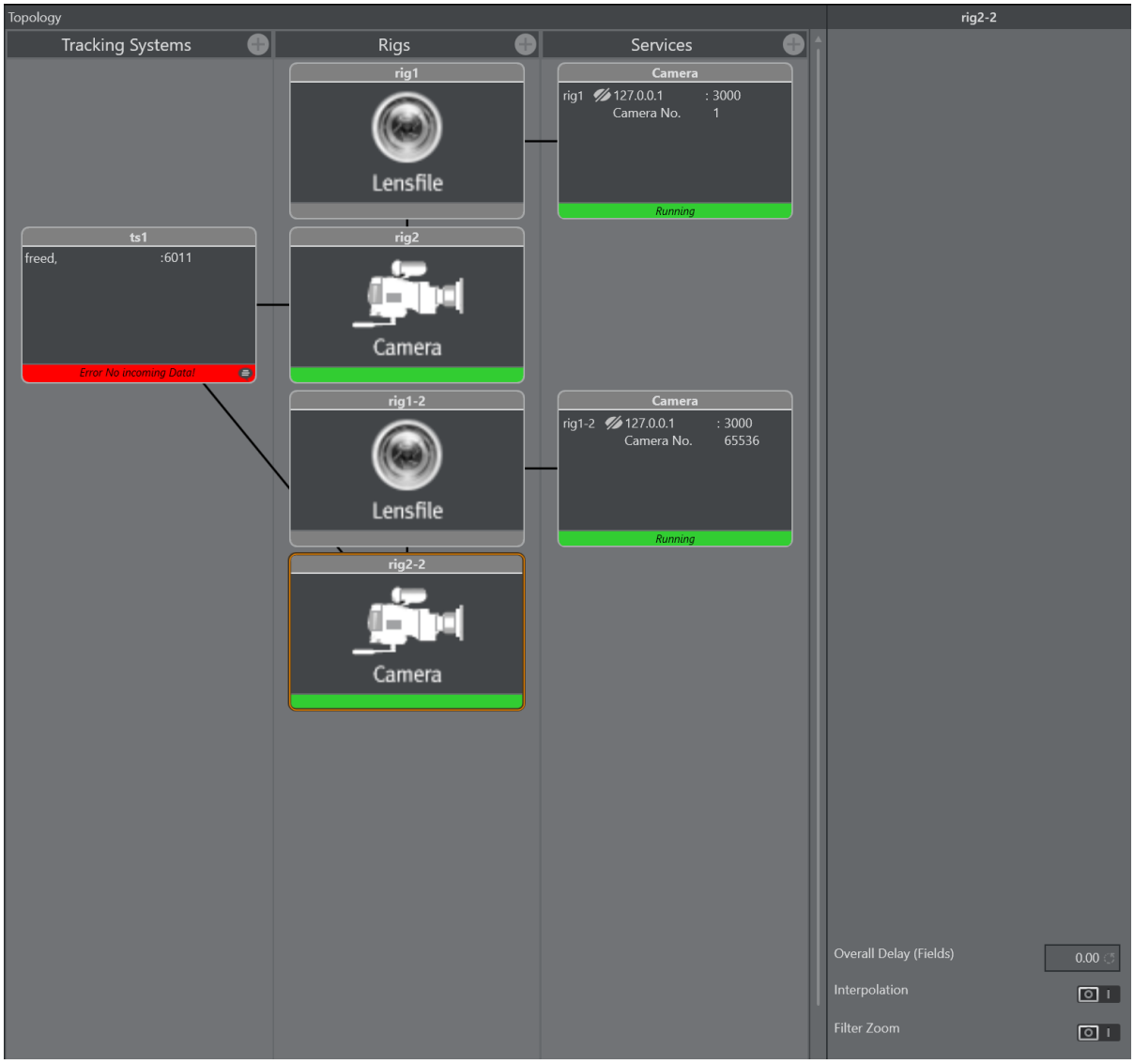



Specify the following values:

- **IP:** Same value as for the first camera service.
- **Tracking Port:** Choose a free port other than for the first camera service. Reuse this port for the Tool Configuration.
- **Command Port:** Same value as for the first camera service.

## 5.3 Delay Configuration

Both camera rigs contain a field *Overall Delay (Fields)*. This allows to specify different delays for sending the camera tracking data to Viz Engine and Reality Connect. Follow the instructions in Delay Configuration to configure the optimal delays.

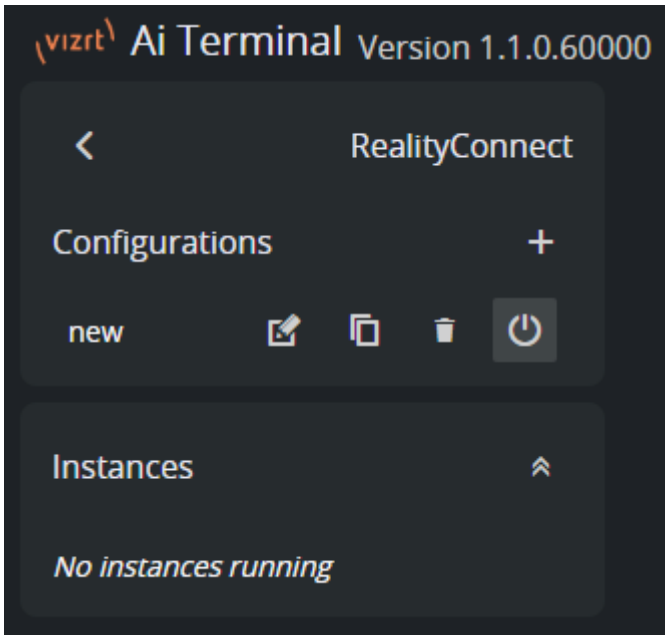


# 6 Tool Configuration

## 6.1 Create Instance

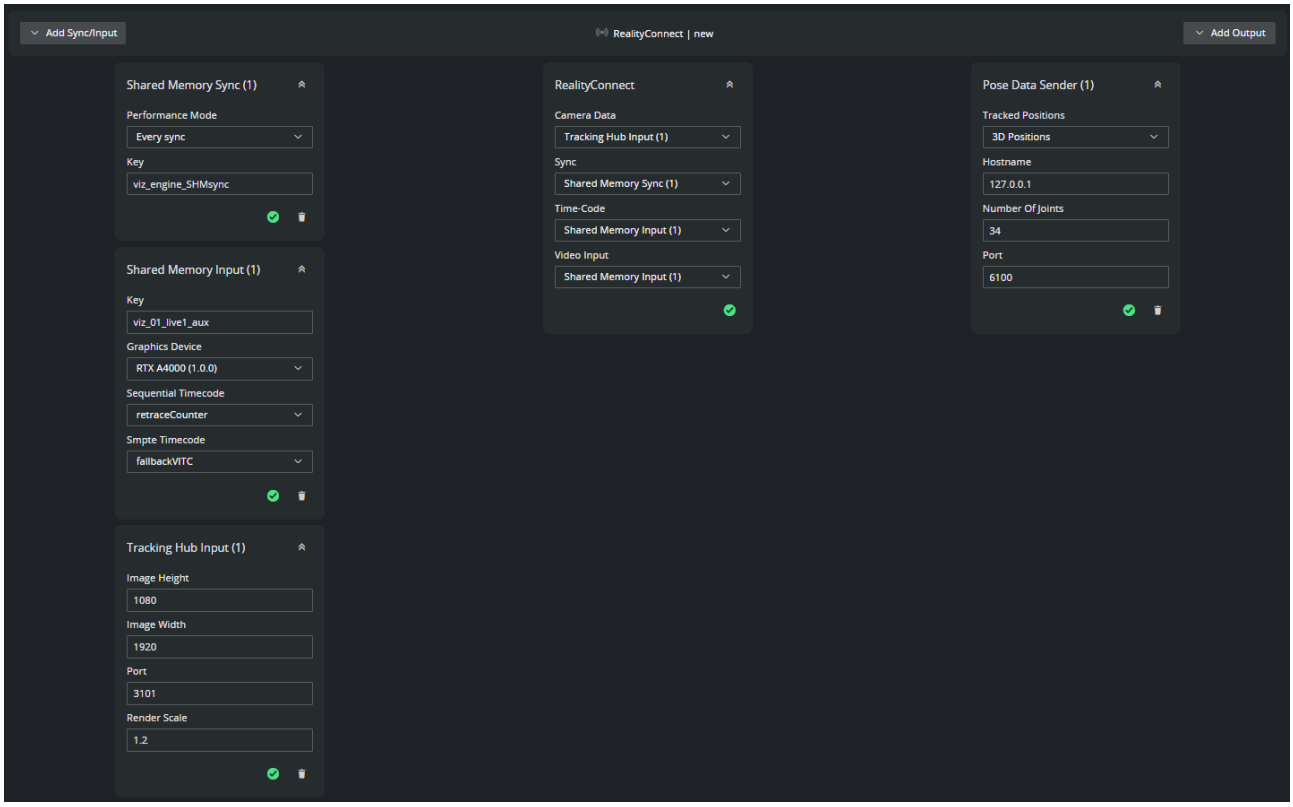
After installation, Reality Connect is automatically discovered by the AI Terminal.

- Create a configuration with the + button.
- Launch an instance with the ⏻ button.




## 6.2 Input/Output Configuration

Create and configure the following input/output modules.




### 6.2.1 Shared Memory Sync

- Choose a **Performance mode**. If performance problems appear later when starting the tool, this mode can be changed to improve performance.
- Specify the same value for **Key** as configured earlier in Viz Engine Configuration.
- Select this input as **Sync** in the Reality Connect box.

### 6.2.2 Shared Memory Input

- Set **Key** to *viz_{instance}_{input}_aux*.
  - *{instance}*: The Viz Engine instance (which is *1* by default).
  - *{input}*: The Viz Engine input (which is *live1* by default).
- Set **Graphics device** to the device Viz Engine is running on.
- Choose any timecodes (only required to fetch the video frequency).
- Select this input as **Video Input** in the Reality Connect box.

### 6.2.3 Tracking Hub Input

- Specify the same value for **Port** as the **Tracking Port** configured earlier in Tracking Hub Configuration for the camera service sending to Reality Connect.
- Specify the **Image Width**, **Image Height** and **Render Scale**, as configured in Viz Engine.
- Select this input as **Camera Data** in the Reality Connect box.

### 6.2.4 Pose Data Sender

- Select *Joint Positions* as the **3D Positions**.
- Set the **Hostname** to *127.0.0.1*. Viz Engine must run on the same computer as Reality Connect.
- Set the **Number of joints** to *34*.
- Specify the same value for **Port** as the **General Communication Port** configured earlier in Viz Engine Configuration.

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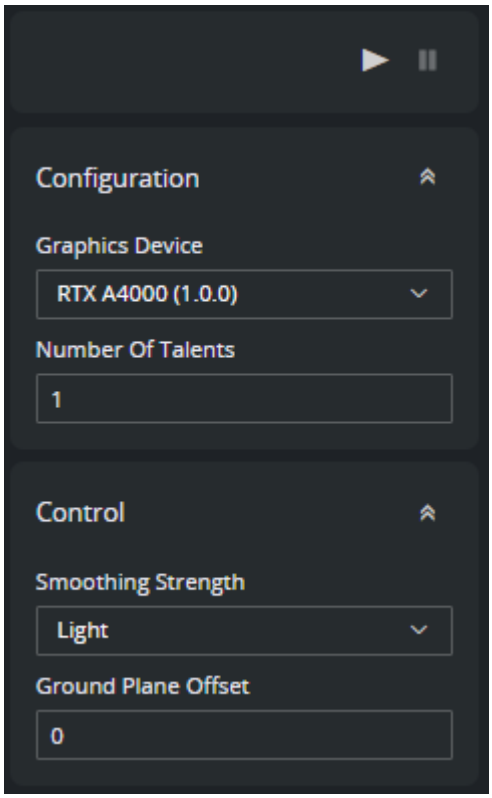
## 6.3 Tool Configuration




### 6.3.1 Configuration

- Select the **Graphics device** that is used by Reality Connect.
- Specify the maximum number of talents to be tracked. This should match the number of models imported earlier in Viz Engine Scene Design.

> **Note:** Despite multiple talents being tracked, this version of Reality Connect does not contain a control mechanism to assign talent models to the actual talents. However, once a talent is assigned to a specific model, Reality Connect tries to always match this talent with the same model even when the talent leaves and enters the scene.

### 6.3.2 Control

- Choose the desired **Smoothing Strength** mode. This affects the quality of the tracked data and the overall system delay (check Delay Configuration for more information).
- Specify the *Z-Position* of the virtual ground plane as **Ground Plane Offset**. This controls on which height the tracked talents are projected to.

> **Info:** The control parameters can be changed dynamically during runtime.

## 6.4 Verify Configuration

Start the tool and verify that no errors are shown. Check the *AI Terminal User Guide* for proposed actions in case of errors.

If all applications are setup as instructed, the models imported as described in Viz Engine Scene Design, should be animated by the tracked talent motion.

# 7 Tool Control

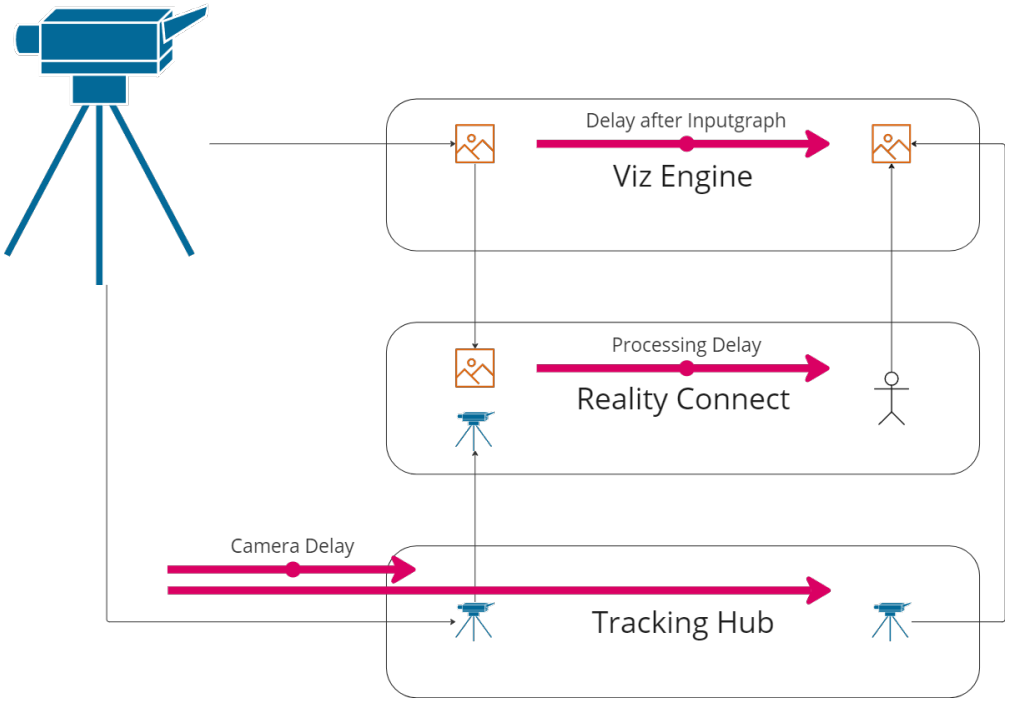
## 7.1 Control Parameters

The control parameters as described in Tool Configuration can be changed dynamically during runtime.

# 8 Delay Configuration

Camera tracking and video data needs to be synchronized both for Viz Engine and Reality Connect. The delays are affected by multiple factors such as hardware performance and parameters. Read through this chapter to learn how to correct these delays.

## 8.1 Overview



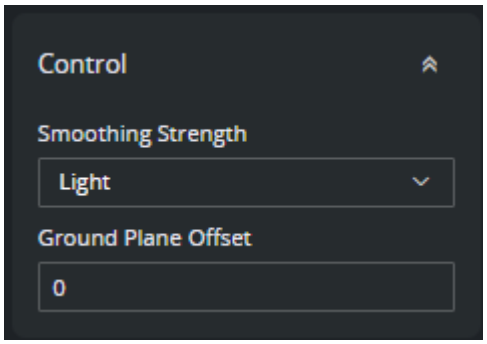

Reality Connect adds an additional delay to the virtual studio system. The image and camera data need to be delayed correspondingly for Viz Engine to render the scene. Details are explained in the following section.

## 8.2 Synchronization Guidelines

Configure the following parameters to synchronize the system.

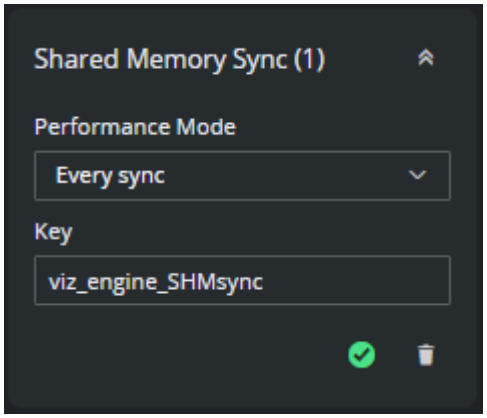
> **Note:** It is important to specify the following delays in a **top-down** order, as some parameters affect others.

### 8.2.1 Smoothing Strength




A stronger **Smoothing Strength** increases the overall delay of the system.

### 8.2.2 Performance Mode




The overall delay of the system is increased when not every field is processed.

> **Info:** This assumes that no performance problems are encountered. If a corresponding warning is displayed choose a different performance mode.

### 8.2.3 Tracking Hub Delay for Viz Engine


Synchronize the camera data with the Viz Engine using the **Overall Delay (Fields)** parameter within the camera rig connected to the Viz Engine. This **Camera Delay** has to be determined experimentally.

For the camera data which is sent to the Viz Engine, add to this **Camera Delay** the **Processing Delay** from the Delay Value Table below.

### 8.2.4 Tracking Hub Delay for Reality Connect


Synchronize the camera data with Reality Connect using the **Overall Delay (Fields)** parameter within the camera rig connected to Reality Connect.

As **Overall Delay (Fields)** set the previously determined **Camera Delay** (*without* the **Processing Delay**).

### 8.2.5 Viz Engine Delay after Inputgraph

This delay synchronizes the talent tracking data received from Reality Connect with the Viz Engine rendering.

Change this delay by executing the following Viz Engine command:

```
MAIN_SCENE*VIDEO*VIDEOIN*1*DELAY_AFTER_INPUTGRAPH SET {X}
```

Choose the **Processing Delay** value *{X}* according to the Delay Value Table at the end of this chapter.

> **Note:** *VIDEOIN*1* refers to *LIVE1* being the camera input source. Change correspondingly if you are using a different input.

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## 8.3 Delay Value Table

| Performance Mode | Smoothing Strength | Processing Delay |
|---|---|---|
| Every sync | Off | 3 |
| | Light | 4 |
| | Medium | 5 |
| | Strong | 7 |
| Every second | Off | 4 |
| | Light | 5 |
| | Medium | 6 |
| | Strong | 8 |
| Every fourth | Off | 8 |

| Performance Mode | Smoothing Strength | Processing Delay |
|---|---|---|
| | Light | 8 |
| | Medium | 8 |
| | Strong | 10 |