Procedure Builder User Manual

—— SUNE WOLFF, CTO

Table of Contents

1 Introduction

Welcome to the SynergyXR Procedure Builder – a first of its kind no-code tool enabling users to build complex training procedures using a simple drag and drop interface. This tool enables subject matter experts to digitize their knowledge as detailed training programs – what we call a Procedure.

In SynergyXR, a Procedure defines a training program containing 3D models, detailed interactions and voice guidance, all embedded in a single intricate piece of content to be placed in a Space. In the Procedure Builder, users can import content and place it in the 3D scene – define what the trainee must do to complete the training procedure, and how the system reacts to the trainee's interactions – and define errors and warnings the trainee can trigger during the training.

1.1 Structure of Procedures

Interactions of a Procedure is defined by a sequence of Steps that can be structured into Step Groups. A Step Group can be seen as a chapter of a training Procedure – it does not introduce any functional change to the Procedure but is a convenient way of structuring a Procedure increasing the readability and maintainability.

A Step consists of the following elements:

- ID: A text string describing what this step does. The ID must be unique – the Procedure Builder automatically adds a trailing integer to ensure uniqueness in case a user reuses an ID.

- Guidance: Users can write textual guidance that will be shown on the Procedure Panel when a trainee is completing the training. Using AI-enhanced text-to-speech the Procedure Builder can generate synthetic voice guidance from the text, providing an instant preview to the user.

- Operation(s): Each Step contains at least one Operation that defines what the trainee must do to complete the Step and proceed in the Procedure. In case more than one Operation in defined in a Step, the trainee can complete all the Operations in arbitrary order, but must complete them all to proceed to the next Step.

- Action(s): As part of an Operation users can define how the system reacts to the trainee performing said Operation. Actions are divided into 'Actions Before' which are executed before

the trainee performs the Operation and 'Actions After' which are executed after the trainee performs the Operation.

Whereas Steps define the main flow of the Procedure, where the trainee must complete each Step to progress to the next, Events are used to define possible interactions running alongside the main Steps of the Procedure.
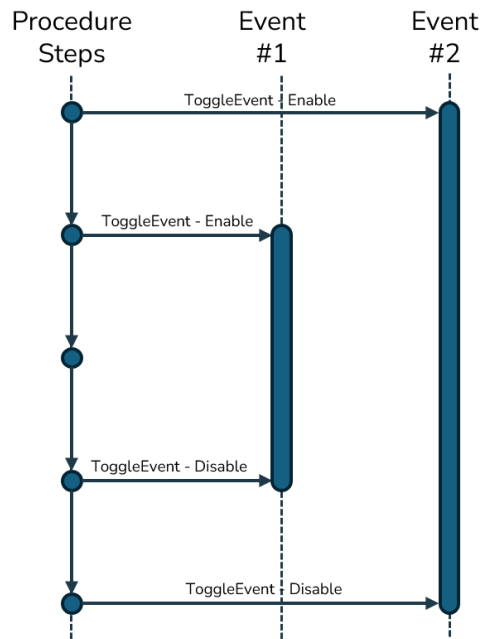

Figure 1: Enabling and disabling multiple Events running in parallel with the main Procedure Steps

Events are often used to describe potential errors the trainee can accidentally make during the Procedure – see Section 7.

2 Workflows

The Procedure Builder can be accessed from the settings menu in the top-right corner of the main UI of SynergyXR for PC.
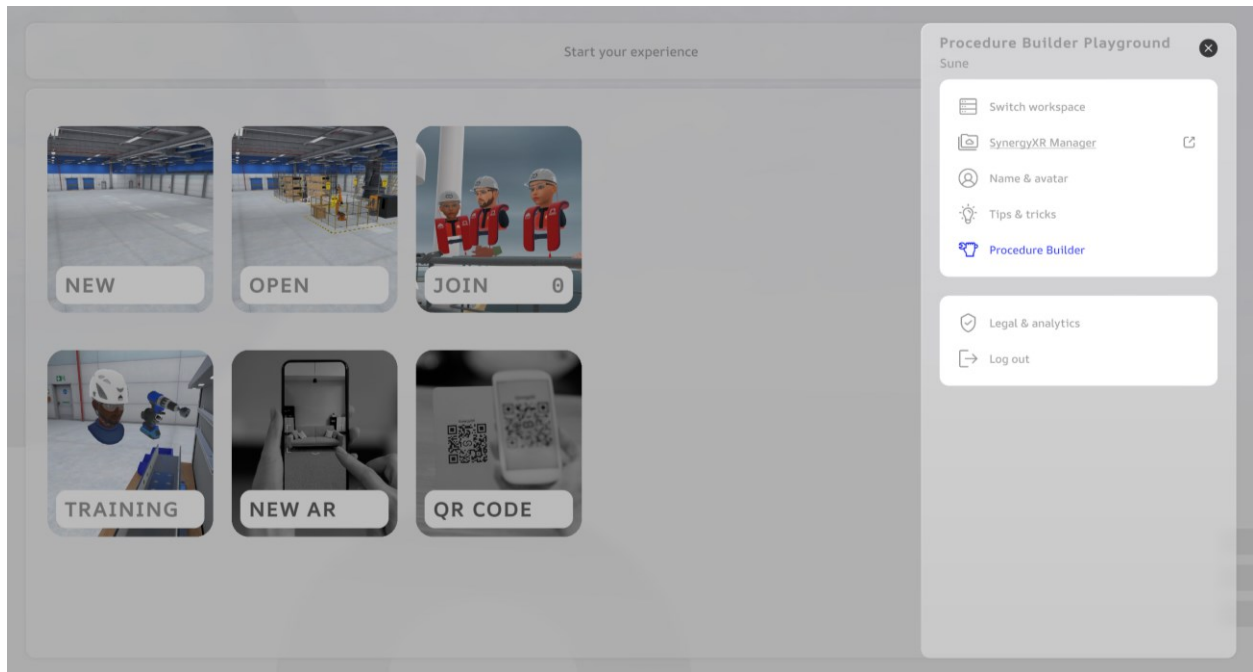
Figure 2: Access to Procedure Builder in the SynergyXR main menu

From here, users have the option to create a new Procedure or open an existing one.
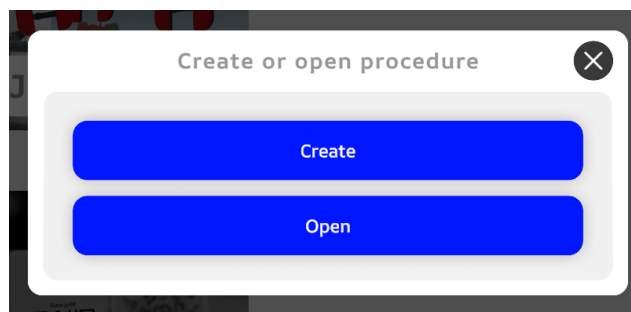
Figure 3: Option to create a new Procedure or open an existing one

2.1 Create new Procedure

Procedures will always be created in the context of a Space. This means that users will need to define a name for both the Procedure and the Space the Procedure is built in. In addition, users must select which Environment is to be used for the Space – this is done from a dropdown menu including all common and custom Environments already available in the Workspace.

NB. The procedure can be loaded into a different environment once it has been deployed to the workspace, as long as it is not too big to fit within the boundaries of that environment.
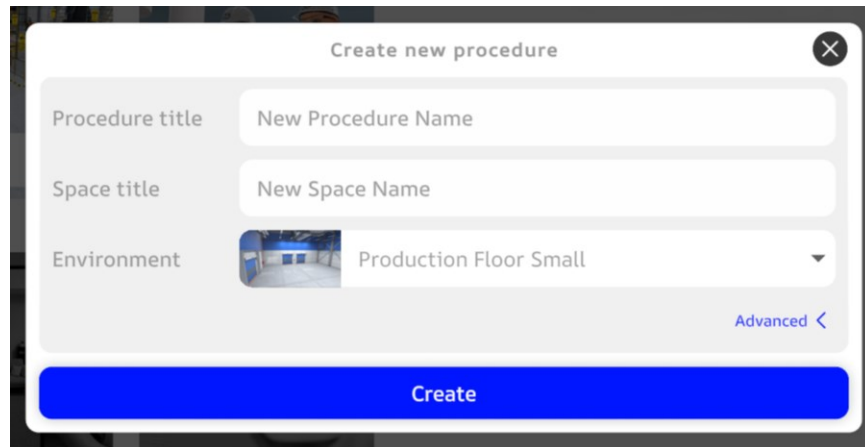
Figure 4: Create new Procedure

Under the advanced options users can create a new Procedure based on an existing one – either from a Procedure already deployed to the Workspace, or from a local file location on the user's PC. This will create a full copy of the chosen Procedure that users can change without affecting the original Procedure. See more information about local save and Workspace deploy in Section 2.4.
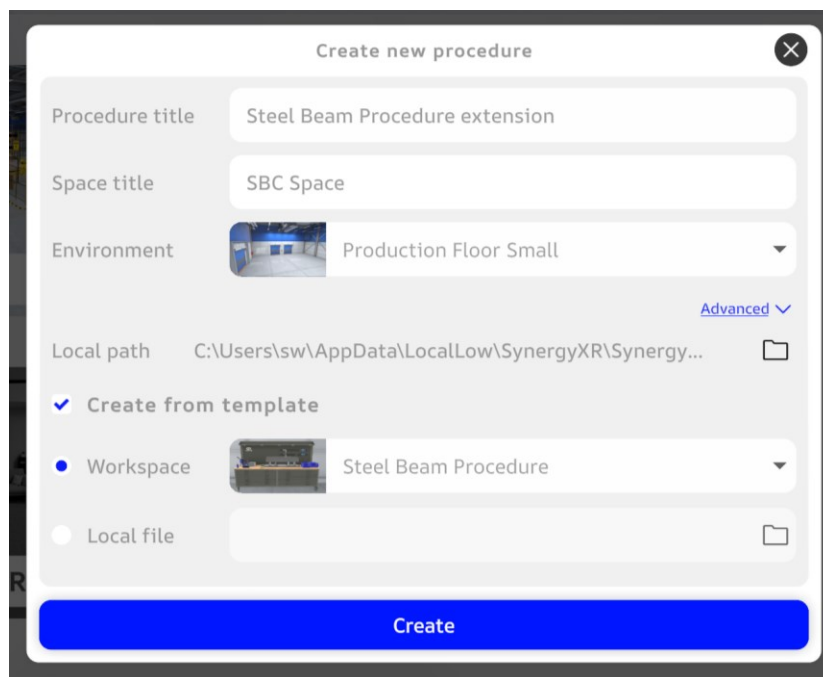
Figure 5: Create new Procedure from template

2.2 Open existing Procedure

Users also have the option to open an existing Procedure – either already deployed to the Workspace or located locally on the user's PC. All Spaces containing a Procedure are shown in the drop-down menu, allowing the user to easily choose between relevant Spaces.

In case the user knows that a colleague has updated the online version, the user can choose to overwrite any local copy of the Procedure there might exist with the version deployed to the Workspace.
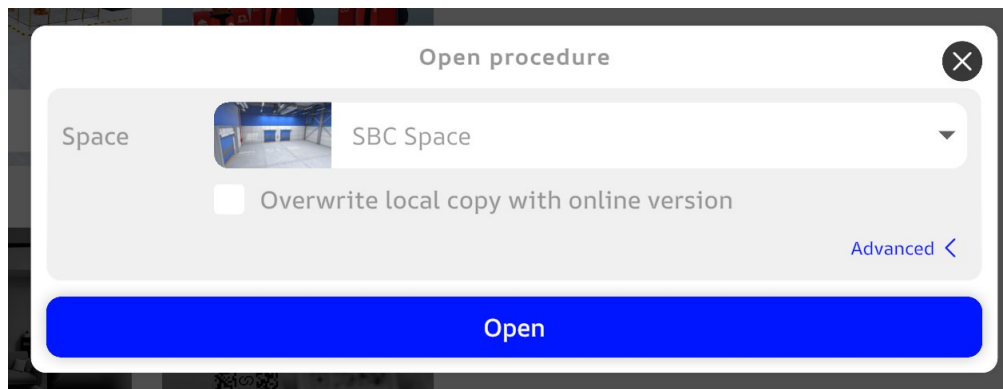
Figure 6: Open existing Procedure

Under the advanced options, the user can also define a new local path where Procedures are saved. See more information about local save and Workspace deploy in Section 2.4.
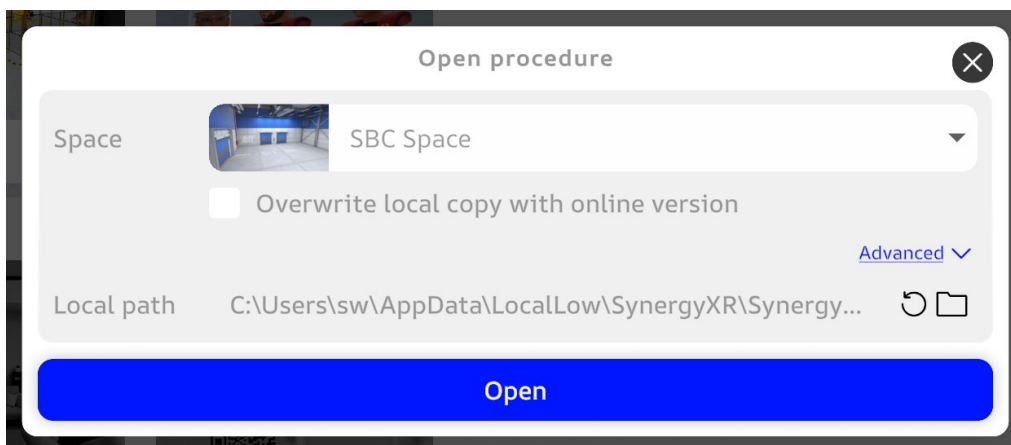
Figure 7: Define local path where existing Procedure is located

2.3 UI overview

Once a new Procedure has been created or an existing Procedure successfully loaded the user is placed in the chosen Space. The normal menu on the left side of the screen is hidden, and the Procedure Builder UI is shown to the user.

Figure 8: Procedure Builder main UI

The UI consist of two main panels – the first is the 'Objects' menu showing the objects in the scene and their internal hierarchy and relationships. This menu can be resized by pulling the bottom-left corner to adjust to the user's needs.

The other is panel is the main menu giving the user several options:

- Misc: This is where users administer the Procedure, by renaming the Procedure, generating a thumbnail, define a minimum version of SynergyXR needed to run the Procedure, add languages and define guidance voice (see more in Section 8), define the virtual bounds of the Procedure, and defining the initial position of the Procedure Panel.

- Content: This is where users can configure content and add instances of content to the scene. See Section 3.

- Steps: This is where the Steps of the Procedure is defined and organized into Step Groups – see Sections 5 and 6.

- Events: This is where events are defined – see Section 7.

- Search: Input field allowing users to search for keywords and references in the Procedure. Two buttons allow users to navigate to previous/next search results.

In the top-right of the UI, users can select which of the defined languages should be used when testing the Procedure (see Section 8) as well as the option to undo/redo:

- Undo: Click the button to undo the last actions you did. Alternatively, use the CTRL+Z key combination.

- Redo: Click the button to redo the last undo you did. Alternatively, use the CTRL+Y or CTRL+SHIFT+Z key combination.

Clicking the cogwheel on the far top-right corner opens the Editor Menu, where users have the following options:

- Test in play mode: Allows users to quickly test out the Procedure they are building without the need of deploying to the Workspace.

- Save to Space: Deploys all changes to the Workspace. See more in Section 2.4.

- Exit Procedure Builder: Returns the user to the SynergyXR main menu.

In the upper-left corner, users can interact with the camera gizmo, allowing them to get a quick axis-aligned view, and switch between the normal perspective view and an orthographic view. See Section 3.

2.4 Save and deploy

When building a procedure, all changes are continuously saved to the local PC in the path specified during creation – see Section 2.1. The default path is defined as:

C:\Users\[YOUR USERNAME]\AppData\LocalLow\SynergyXR\SynergyXR\Procedures

It is possible for users to define an alternative local path when creating a Procedure. This is very useful if you keep your Procedures under version control using e.g., Git making team collaboration much easier and safer.

From the Editor Menu, the user has the option to deploy the Procedure to the Workspace, by selecting Save to Space. A warning will be shown telling the user that this action will overwrite the live Procedure, and by accepting this, the changes will go live to the Workspace ready for colleagues to enjoy the Procedure.

3 Navigating the scene

There are several ways users can navigate the scene:

- Movement: Using WASD the user can move around in the scene – W: forward; A: left; S: back; and D: right. Users can also use Q to move directly up, and E to move directly down. Using SHIFT+WASD will increase the movement speed allowing users to cover larger distances.

- Rotation: Holding the right-mouse button will rotate the view while keeping the same position. Holding ALT+right-mouse button will orbit the view around the current focus, enabling the user to rotate around an object while keeping the object in focus.

- Zoom: Using the scroll wheel users can zoom in and out of the current view.

- Focus: Pressing F will center the view on the selected object – see Section 3.2.

3.1 Camera gizmo

The Procedure Builder also offers a camera gizmo located in the top-left corner, allowing users fine control over the view:

- Axis-aligned view: By clicking one of the cones (x, y, or z), the user is presented with an axis-aligned view of the scene.

- Perspective view: This is the normal view where the scene is rendered in normal perspective, where objects further away appear smaller.

- Orthographic view: This is a special view where the scene is rendered "flat" without any perspective. In this mode, rotation is disabled, always offering an axis-constraint view. This mode is very useful when aligning objects precisely. Users can switch between perspective and orthographic view by clicking the label under the camera gizmo, or by clicking the cube in the center of the gizmo.

- Info: Clicking the small light bulb will show a panel explaining how to navigate the scene.

3.2 Object focus

It is possible to get objects into focus by double-clicking the object in the Object panel or in the Steps panel. On subsequent double-clicks, the object will stay in focus but switching between two different zoom levels. The same object focus can be achieved by pressing the ´F´-key.

4 Content configuration

Users need to import and configure content before it can be used. There are three categories of content that is explained in the following sections. Users can import a new piece of content by pressing the small ´+´ under each content category.

4.1 3D models

The following file formats are supported for 3D content: .GLB and .FBX.

Once imported, the 3D content is placed in the content configuration scene, where the user can utilize normal scene navigation to move/rotate around the object – see Section 3. In the content configuration scene, the user has several options:

4.1.1 Object hierarchy

This list shows the object hierarchy with any sub-meshes and child components. It is not possible to re-arrange this hierarchy – this must be done in external 3D modelling software.

4.1.2 Target reference

This list shows any additional child objects the user has created inside the Procedure Builder – called a Target Reference. Target References can be used as the Target for 'Grab and Place' Operations, 'Use Tool' Operations and 'Transform Object' Actions to have a shared offset. This makes it possible to set and adjust the offset of multiple Operations and Actions in one place.

Users can add another Target Reference by clicking the '+' in the Object Hierarchy panel or the '+' in the list of Target References. A Target Reference has the following data associated:

- Target: The name of the parent in the hierarchy. Users can define this by drag-and-drop from the Object Hierarchy.

- Position: The position relative to the Target parent.

- Rotation: The rotation relative to the Target parent.

- Scale: The scale relative to the Target parent.

- Layer: Options to define specific layer attributes:

    o Default: No additional functionality

    o Teleport: Trainees can teleport onto any colliders added to the Target Reference

    o Ignore Collisions: When trainees navigate the Procedure, it is possible to walk through any colliders attached to the Target Reference. This is needed for certain operations such as 'Move inside area' – see Section 5.7.

4.1.3   Collider descriptions

This list shows any colliders added to the 3D object. Colliders are used to define physical shapes that interact naturally with other physical objects, like dropping a tool on a table, ensuring that the tool collides with the table instead of falling through it.

All Colliders must have a Target defined, which must be a child component or Target Reference of the 3D object. Users can configure three different types of colliders:

- Box: A box-shaped collider defined by:

    o Center: Position relative to the Target parent.

- o   Size: The size of the box collider defined by an x-, y- and z-size

- Sphere: A sphere-shaped collider defined by:

  - o   Center: Position relative to the Target parent.

  - o   Radius: Size of the collider defined by the radius.

- Capsule: A capsule-shaped collider defined by:

  - o   Center: Position relative to the Target parent.

  - o   Radius: Size of the cylinder part of the collider defined by the radius.

  - o   Height: Size of the collider defined by the height.

  - o   Direction: '0' defines a capsule lying down along the x-axis; '1' defines a capsule standing up along the y-axis, and '2' defines a capsule lying down along the z-axis. All relative to the rotation of a Target parent.

The Procedure Builder will always try to adjust the size of the collider to fit the size of the object it is attached to. Users can always adjust the position and size of the collider, by changing the values directly in the input fields, or more conveniently by dragging the small green cubes that define the control points of the collider.
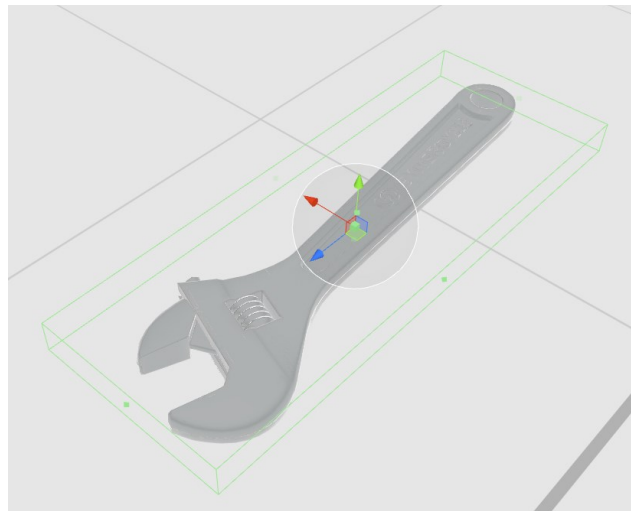

Figure 9: Box collider with green cube control points on all faces

4.1.4   Grab points

Grab points allow the user to define how the object is grabbed in VR. If none are defined, SynergyXR will make a best guess, but for the ultimate control, users should consider defining custom grab points.
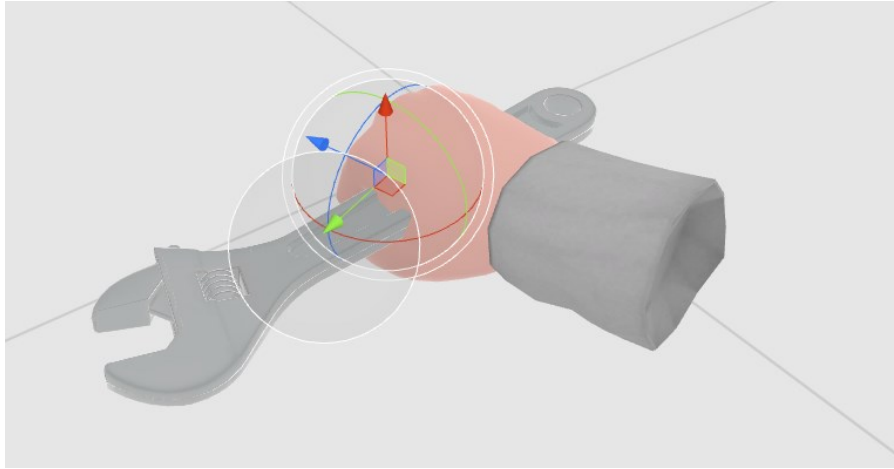
Figure 10: Hand emulator when adding/adjusting grab points

Adding a grab point will spawn a hand emulator that the user can move and rotate around using a 3D gizmo in the content configuration scene. It is possible to define the following parameters:

- Position: The positional offset from the center of the object.

- Rotation: The rotation of the hand.

- Hand pose type: Defines which hand pose should be used when the trainee grabs the object. Using a drop-down menu users can choose between 'idle', 'point', 'pinch suggest', 'pinch', 'grab suggest', 'grab', 'grab pen', 'grab eraser', 'grab laser pointer', and 'grab tablet'. The hand emulator will reflect the chosen hand pose type.

It is possible to define multiple grab points for both left- and right-hand side, but only the first in the list will be used when trainees go through the finished Procedure.

4.1.5   3D content instance

Once the 3D object is configured, the user can press 'Add to procedure' to finish the configuration. This adds the fully configured 3D object to the Content overview on the right-hand panel of the Content menu.

For the 3D object to appear in the scene, users must create an Instance of the configured 3D object. This is done by pressing the blue ´+´ located directly under the configured 3D object in the Content menu. Each instance can have the following parameters defined:

- Alias: The name of the instance in the scene Object hierarchy. This is an ID that must be unique in the Procedure to be able to be uniquely reference it in individual Steps.

- Position: The position in the scene. This can either be set by adjusting the 3D gizmo in the scene, or by manually typing in digits in the input fields.

- Rotation: The rotation in the scene. This can either be set by adjusting the 3D gizmo in the scene, or by manually typing in digits in the input fields.

- Scale: The scale of the object in the scene, relative to the originally configured 3D object. This can either be set by adjusting the 3D gizmo in the scene, or by manually typing in digits in the input fields. We recommend using uniform scaling to avoid stretching the object on one or more axis.

- Enabled: Boolean toggle defining if the object is enabled and visible in the beginning of the Procedure. Users can use the 'Change visibility' Action to change this in individual Steps – see Section 6.10.

All instances are linked to the configured content. Users can always adjust the configuration by pressing the cogwheel icon next to a configured 3D object. Any changes made to the configuration are automatically applied to all instances added to the scene.

4.2 Image content

Users can also import image content, that can be used for the Action called "Change image" – see Section 6.5. Both .PNG and .JPEG file formats are supported.

4.3 Audio content

Users can also import audio content, that can be used for the Action called "Play audio" – see more in Section 6.2. Both .MP3, .WAV and .OGG file formats are supported.
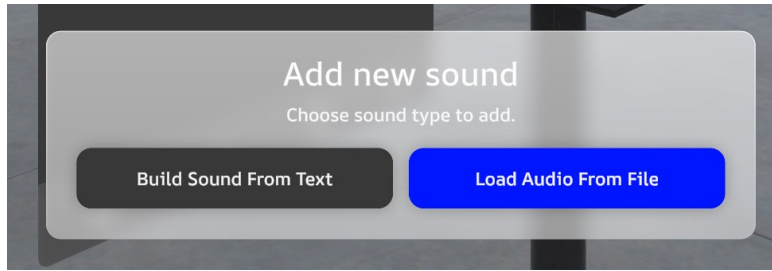
Audio files can also be generated from text – by a similar method as for guidance in Steps – see Section 1.1. Choose the 'Build Sound From Text' option, and add the text in the input field and press the play button. Audio can be generated in several languages – see Section 8.

5 Operations

Each Step contains at least one Operation that defines what the trainee must do to complete the Step and proceed to the next Step in the Procedure. In case more than one Operation in defined in a Step, the trainee must complete all the Operations but can do so in any arbitrary order.

SynergyXR provides the following Operations:

5.1 Grab and place

Useful when the trainee must pick up an object and place it somewhere else. This operation can be used to re-parent objects, which is useful if the placement should result in the two objects being attached – in an assembly operation for example.

The following parameters can be set by the user:

- Object: The object the trainee must grab and place somewhere else. Drag and drop a reference to this object from the Object hierarchy.

- New parent: Defines the new parent of the 'Object'. The Operation will result in the 'Object' becoming a child object to the 'New parent' object.

- Place at original position: Places the 'Object' back at the original position it was placed in the scene. Can be used as an alternative to defining a 'New parent' and adjusting 'Position' and

'Rotation' – useful when making an assembly training: import the complete assembled model – disassemble use object using the 'Transform object' Actions on each individual object (see Section 6.9) – define a series of Steps asking the trainee to assemble the model using 'Grab and place' with this parameter set.

- Position: The position relative to the 'New parent'. Used to adjust the position of the 'Object' – either by typing numbers directly into the input field or by dragging the 3D gizmo in the scene.

- Rotation: The rotation relative to the 'New parent'. Used to adjust the rotation of the 'Object' – either by typing numbers directly into the input field or by dragging the 3D gizmo in the scene.

There are also a few noteworthy parameters hidden under the 'Show more' button:

- Release anywhere: Allows the trainee to release the grabbed 'Object' anywhere. Can be useful if the specific destination position is not important.

- Socket size: In a Procedure, a 'Socket' is the area within which you need to drop the 'Object' for it to snap into place. Using this parameter, users can adjust the size of the 'Socket' to make it either smaller requiring even more precise 'Grab and place' Operations, or larger to make it easier for trainees to complete the Operation.

- Socket offset position: Used to offset the position of the 'Socket' a bit to make it easier to drop the 'Object' correctly. It is not advised to move the 'Socket' away from the drop position – only adjust it slightly.

- Socket offset rotation: Used to offset the rotation of the 'Socket' a bit to make it easier to drop the 'Object' correctly.

- Non-VR rotation: Used to rotate the 'Object' for a better visual orientation on 2D devices like PC and iPhone. Copy-paste values from the 'Rotation' parameter for a good starting point. A white ghost outline of the 'Object' is shown to guide the user in setting this parameter appropriately.

5.2 Look at

Useful when the trainee must look at an object for a specific period of time – for example when checking a warning light. The following parameters can be set by the user:

- Target: The Object that the trainee must look at.

There are also a few noteworthy parameters hidden under the 'Show more' button:

- Duration: Define the duration in seconds, the trainee must keep looking at the 'Object'. This overrides the default 1 second duration.

5.3 Move inside area

Useful when the trainee must move inside an area or 3D volume in the scene. This Operation is often used in Events (see Section 7) for example to trigger danger zones the trainee should not walk into during the Procedure.

The following parameters can be set by the user:

- Target: Defines the target collider the trainee must walk into.
  N.B. the parent Target Reference of the collider should have the Layer setting 'Ignore collisions' – see Section 4.1.2.

There are also a few noteworthy parameters hidden under the 'Show more' button:

- Area is outside target: Allows the user to define the inverse area of the 'Target'. Useful when defining the 'Deactivate operation' of an Event – see Section 7.

5.4 Move to

Useful when the trainee must move to a specific position in the scene. The following parameters can be set by the user:

- Position: The position in the 3D scene the user must move to. This is shown by a bright glowing beacon.

There are also a few noteworthy parameters hidden under the 'Show more' button:

- Diameter: The user can change the diameter of the beacon. This changes both the visual representation, and the precision with which the trainee must move to the 'Position' – the trainee must be inside the 'Diameter' to complete this Operation.

5.5 Override settings

Enables the user to override the default settings regarding highlighting and guidance visibility in other Operations. All the noteworthy parameters are hidden under the 'Show more' button:

- Operation override settings: Allows the user to override the default settings regarding highlighting and guidance visibility in other Operations:

  - Show through geometry: Normally this setting is set to 'false'. If changing to 'true', the trainee experiences x-ray vision so the geometry of the object shown at the socket location is always visible

  - Show highlight: Normally this setting is set to 'true'. If changing to 'false' neither the circular placement indicator nor the geometry highlight of the object is shown at its starting location

  - Show highlight socket: Normally this is set to 'true'. If set to 'false' the "ghost" version of the object will not be shown at the target (socket) location.

  - Show placement indicator: Normally this is set to 'true'. If set to 'false' the placement indicator of a 'Grab and place' Operation is not shown. Instead, if Show Highlight is true, a geometry highlight of the object will be shown at the starting location

  - Show highlight line: Normally this is set to 'true'. If set to 'false' the line between the Object and the target socket location of a 'Grab and place' Operation is not shown.

These new settings persist for the duration of the Procedure or until changed again in a subsequent 'Override settings' Operation.

5.6 Press

Useful when the trainee must press a button, or for simple interaction-based triggers. The following parameters can be set by the user:

- Target: Defines the object the trainee must interact with. This can be a button, a door handle, or anything that makes sense for the Procedure.

- Hand pose: Defines how the trainee's VR hand is animated when performing the press Operation. Choose between: 'idle', 'point', 'pinch suggest', 'pinch', 'grab suggest', 'grab', 'grab pen', 'grab eraser', 'grab laser pointer' and 'grab tablet'.

There are also a few noteworthy parameters hidden under the 'Show more' button:

- Duration: Defines how long (in seconds) the trainee must press the 'Target'. This overrides the default 0 second duration.

- Press type: Defines how the trainee must press the button:

    o Press: Requires the trainee to use the trigger button on the VR controller to confirm the press Operation.

    o Touch: Requires the trainee's hand to intersect with the 'Object' to confirm the press Operation.

    o Press or touch: Gives the trainee the freedom to either press or touch the 'Object' to conform to the press Operation.

    o Grab: Requires the trainee to use the grab button on the VR controller to confirm the press Operation.

    o Distance press: Allows the trainee to confirm the press Operation from a distance. The 'Distance' parameter should be set alongside this option.

- Axis: Defines the axis the 'Object' must be pressed.

- Distance: Defines the distance the 'Object' must be pressed. When used in combination with the 'Axis' parameter, the 'Object' will automatically be animated when the trainee presses it – without using a separate Action like the 'Transform object' – see Section 6.9.

5.7 Reach inside area

Useful when the trainee must reach inside an area. Often used to model errors using Events. Only relevant on platforms tracking the trainee's hands, e.g., VR. On non-VR platforms, this Operation falls back to the 'Move inside area' Operation – see Section 5.3.

The following parameters can be set by the user:

- Target: Defines the target collider the trainee must reach into with their hands.
  N.B. the parent Target Reference of the collider should have the Layer setting 'Ignore collisions' – see Section 4.1.2.

There are also a few noteworthy parameters hidden under the 'Show more' button:

- Both hands: The trainee must reach inside the 'Target' with both hands at the same time to complete this Operation.

- Area is outside target: Allows the user to define the inverse area of the 'Target'. Useful when defining the 'Deactivate operation' of an Event – see Section 7.

5.8 Move or rotate object

Useful when the trainee must perform an axis-constraint move or rotate of an object. Useful when rotating a valve or sliding a handle. The following parameters can be set by the user:

- Object: Defines the object the trainee must grab and either move or rotate.

- Mode: Choose between 'Move' and 'Rotate'. Combinations are currently not supported.

- Rotation type: Choose between 'Wrist' (trainee only need to rotate their wrist) and 'Drag' (trainee must rotate an object around a pivot point). This parameter is only valid if 'Mode: Rotation' is selected.

- Axis: Defines the axis the object move must be performed along or the axis the object must be rotation around.

- Distance: How far (in cm) the object must be moved, or the number of degrees the object must be rotated.

- Hand pose type: Defines how the trainee's VR hand is animated when performing the Operation. Choose between 'idle', 'point', 'pinch suggest', 'pinch', 'grab suggest', 'grab', 'grab pen', 'grab eraser', 'grab laser pointer' and 'grab tablet'.

There are also a few noteworthy parameters hidden under the 'Show more' button:

- Dead zone: Allows the trainee to complete the operation without reaching the far end of the Distance. If releasing the move or drag after moving or rotating the 'Object' at least the defined 'Distance' minus the defined 'Dead zone', the Operation is completed.

- On progress actions: Allows the user to setup an Action that will progress based on the progress of this Operation. E.g., where the trainee is asked to rotate the handle of a vertical drill, the 'On progress action' be a 'Translate object' Action moving the vertical drill synchronous with the handle being rotated.

5.9 Use tool

Useful when the trainee must pick up a tool and use it on an object in the scene. The following parameters can be set by the user:

- Tool: Defines the tool object that the trainee must pick up and use on the 'Target'.

- Target: Defines the object that the trainee must use the 'Tool' on.

- Position: The position of the 'Tool' when used on the 'Target'. This parameter is used to adjust the position of the 'Tool' – either by typing numbers directly into the input field or by dragging the 3D gizmo in the scene.

- Rotation: The rotation of the 'Tool' when used on the 'Target'. This parameter is used to adjust the rotation of the 'Tool' – either by typing numbers directly into the input field or by dragging the 3D gizmo in the scene.

- Progress indicator height: Adjust the height of the progress indicator icon shown above the 'Position'.

- Progress indicator icon: Set the icon shown in the progress indicator. Choose between 'eye', 'hammer', 'screwdriver', 'wrench', 'liquid', 'pen', 'clean', 'hold', 'image documentation', 'inspect', 'location', 'press', 'send mail', 'verbal documentation', 'wait timer', 'writing document', 'measurement' and 'key'.

There are also a few noteworthy parameters hidden under the 'Show more' button:

- Duration: Defines how long (in seconds) the trainee must hold the 'Tool' on the 'Target'. This overrides the default 1 second duration.

- Non-VR rotation: Defines the rotation of the 'Tool' when used on the 'Target' on a non-VR platform to ensure the interaction looks more realistic.

5.10 Wait

Useful when the trainee must wait for a specific period of time. The following parameters can be set by the user:

- Wait for: Defines what the trainee must wait for. Choose between 'Voice guidance' or 'Duration'. If 'Voice guidance' is chosen, the Operation is automatically completed once the voice guidance has been played for the trainee.

- Duration: Defines how long (in seconds) the trainee must wait. Only relevant if 'Duration' is selected in the 'Wait for' parameter.

6 Actions

Actions can be used to ensure the Procedure reacts to the trainee progressing through the Steps. Each Operation has a list of 'Actions before' that are being executed concurrently when the trainee reaches the Step, and a list of 'Actions after' that are being executed concurrently as soon as the trainee has completed the Operation.

If the user wants several Actions to play one after the other, the user can make use of the 'Duration' and 'Delay' parameters of individual Actions. These can be found under the 'Show more' button of each Action.

6.1 Play animation

Used when the Procedure must play an animation embedded in a 3D model. The following parameters can be set by the user:

- Object: Defines the 3D object with the embedded animation to be played. Only objects with animations are valid for this parameter – indicated by the animation icon found in the Objects hierarchy.

- Animation name: Defines the animation to be played. The user can select between valid animations via the drop-down menu.

- Action: Defines if the animation should start playing ('Play') or if it should be stopped ('Stop').

- Mode: Defines how the animation should be played. Choose between:

  o 'Once' (only play the animation once from beginning to end);

  o 'Loop' (repeatedly play the animation from beginning to end until the 'Stop' Action is chosen in a subsequent Play animation Action); and

  o 'Ping-pong' (repeatedly play the animation from beginning to end and reverse back to beginning until the 'Stop' Action is chosen in a subsequent Play animation Action.

There are also a few noteworthy parameters hidden under the 'Show more' button:

- Start frame: Defines the start frame of the animation. Can be used to crop the beginning of the animation, or to split the animation track into several smaller clips used at specific steps.

- End frame: Defines the end frame of the animation. Can be used to crop the end of the animation, or to split the animation track into several smaller clips used at specific steps.

- Frame rate: Defines the rate of which frames are evaluated. Normally this should match the frame rate of the recorded animation, but this parameter can also be used to speed up the animation (setting the 'Frame rate' higher than the recorded frame rate) or slow down the animation (setting the 'Frame rate' lower than the recorded frame rate).

6.2 Play audio

Used when the Procedure must play an audio file already configured – see Section 4.3.

The following parameters can be set by the user:

- Audio clip: Use the drop-down menu to select between configured audio files.

- Action: Choose between 'Play', 'Pause', 'Resume' and 'Stop'.

- Location: Can be used to specify a position in the scene defining the source of the audio (played as a 3D spatial audio file). If not specified, the audio is played omnipresent without a specific position.

There are also a few noteworthy parameters hidden under the 'Show more' button:

- Volume: Change the volume of the 'Audio clip'. This must be value between '0' and '1' representing 0% to 100% of the original volume.

- Loop: Specify if the 'Audio clip' should continue playing continuously, until paused or stopped using another 'Play audio' Action with the 'Action' set to 'Pause' or 'Stop' respectively.

- Play count: Specify how many times the 'Audio clip' must be played.

- Interrupt guidance: Specify if the 'Audio clip' should interrupt any audio guidance currently playing. Especially useful for Events that could be triggered while guidance for another Step is playing, but the user wants the Event audio take precedence. If audio guidance is interrupted by this Action, it will start over playing the audio guidance once this Action is done playing.

6.3 Equip

Used when the trainee must put on equipment (e.g., personal protection equipment). Often used as a reaction to the trainee completing an Operation that mimics the trainee picking up a piece of equipment and equipping it – by using a 'Grab and place' Operation. The following parameters can be set by the user:

- Equipment: The equipment object in the scene that the trainee and all co-trainees should get equipped on their avatar.

- Unequip: As default, the Equip Action will ensure all trainees equip the Equipment. This parameter can be used to unequip the Equipment if that is desirable.

6.4 Make grabbable

Used to make an object grabbable by the trainee. Also ensures the object is affected by gravity when dropped. The following parameters can be set by the user:

- Object: Specify the object that the trainee should be able to grab and pick up.

6.5 Change image

Used when a texture of a 3D model must be changed. Can be used to e.g., change the image of a PC screen to simulate the trainee progressing through the menus of the software running on the PC. NB. Once this Action is used on a 3D model, the 'Change Material' Action (see Section 6.6) is no longer valid on that model since the underlying Material has been changed.

The following parameters can be set by the user:

- Object: Specify the object containing a 'Material' using a texture that should be changed.

- Image: Use the drop-down menu to select between configured image content – see Section 4.2.

- Material: Specify the material using the texture that should be exchanged for the 'Image'. The user can select from the drop-down menu of all materials contained in the Object.

6.6 Change material

Used to change material parameters of a 3D model. Can be used to alter the appearance or for animated highlight of objects. The following parameters can be set by the user:

- Object: Specify the Object containing a 'Material' that should have one or more parameters changed.

- Material: Specify the material that should have one or more parameters changed. The user can select from the drop-down menu of all materials contained in the Object.

- Base color: Change the base color of the 'Material'. This color will be added on top of any texture applied to the material.

- Mode: Specify how the material change should happen. Select between 'Once', 'Loop' and 'Ping pong'. If 'Loop' or 'Ping pong' is chosen, the material change will be animated between the existing and the new settings over the 'Duration' specified – see below.

There are also a few noteworthy parameters hidden under the 'Show more' button:

- Duration: Specify the duration of the material change. Used to animate the material change over time.

- Emission HDR color: Sets an emissive color for a brighter result then just the base color. Can be used to dramatically highlight object.

6.7 Move procedure panel

Used to move the Procedure Panel – great to ensure the trainee always has the panel close at hand when progressing through the Procedure.

The following parameters can be set by the user:

- Position: Defines the new position of the Procedure Panel. Can be changed either by typing numbers directly into the input field or by dragging the 3D gizmo in the scene.

- Rotation: Defines the new rotation of the Procedure Panel. Can be changed either by typing numbers directly into the input field or by dragging the 3D gizmo in the scene.

6.8 Toggle event

Used to enable or disable one or more Events.

The following are parameters can be set by the user:

- Enable: List of Events to enable – select from the drop-down menu listing all defined Events.

- Disable: List of Events to disable – select from the drop-down menu listing all defined Events.

6.9 Transform object

Used when an object should be moved, rotated and/or scaled.

The following parameters can be set by the user:

- Object: Specifies the object to be moved, rotated and/or scaled.

- Position: Specifies the new position of the 'Object'. Can be changed either by typing numbers directly into the input field or by dragging the 3D gizmo in the scene.

- Rotation: Specifies the new rotation of the 'Object'. Can be changed either by typing numbers directly into the input field or by dragging the 3D gizmo in the scene.

- Scale: Specifies the new scale of the 'Object'. Can be changed either by typing numbers directly into the input field or by dragging the 3D gizmo in the scene.

There are also a few noteworthy parameters hidden under the 'Show more' button:

- Duration: Specify the duration (in seconds) of the transform action. Used to animate the transformation over time. Overrides the default 0.75 seconds duration.

- New parent: Defines the new parent of the 'Object'. The Action will result in the 'Object' becoming a child object to the 'New parent' object if this parameter is set.

6.10 Change visibility

Used when a 3D model should be hidden or shown. The following parameters can be set by the user:

- Object: Specifies the object that will change visibility.

- Style: Choose between:

  o Enable object: Enable the 'Object'. Child objects will resume their enable/disable state from before the parent 'Object' was disabled.

  o Disable object: Disable the 'Object' and all child objects. All child objects will remain disabled until their parent 'Object' is enabled again.

  o Show mesh: Show the enabled 'Object' and all children in the scene.

  o Hide mesh: Hide the enabled 'Object' and all children in the scene.

7 Events

Whereas Steps define the main flow of the Procedure, where the trainee must complete each Step to progress to the next, Events are used to define possible interactions running alongside the main Steps of the Procedure. Events are often used to describe potential errors the trainee can accidentally make during the Procedure.

Events are defined in the Events tab of the Procedure Builder interface – add a new Event using the small blue '+'.

As the user is working on defining an Event, the scene will reflect the current state of the event – without taking other Events into account. It is also possible to select 'Simulate as a sequence' so all Events are simulated one after the other, resulting in the state of the event taking past Events in the list into account.

Users can configure the following in an Event:

- Activate trigger: Specify how many trainees are needed to activate the Event. Choose between 'When one player activates' or 'When all players have activated'.

- Deactivate trigger: Specify how many trainees are needed to deactivate the Event. Choose between 'When one player activates' or 'When all players have activated'.

- Is error: Let the system know if the Event is to be treated as an error. When a trainee completes the Procedure through the LMS integration, a score board is shown in the end summarizing how many errors were triggered.

- On enter actions: List of Actions that will be executed when the Event is enabled as result of a 'Toggle event' Action – see Section 6.8.

- Activate operations: Defines the Operations the trainee must perform to activate the Event. Multiple Operations can be defined – when the first of these are performed by the trainee the Event is activated.

- On activate actions: List of Actions defining how the system responds to the user activating the event.

- Deactivate operations: Defines the Operations the trainee must perform to deactivate the Event. Multiple Operations can be defined – when the first of these are performed by the trainee the Event is activated.

- On deactivate actions: List of Actions defining how the system responds to the user deactivating the event.

- On exit actions: List of Actions that will be executed when the Event is disabled as result of a 'Toggle event' Action – see Section 6.8.

8 Multi-language support

Procedures in SynergyXR supports multiple embedded languages for textual and voice guidance. A trainee can select between available languages in a drop-down menu on the start panel before starting a Procedure.

8.1 Add new language

When building a Procedure, a user can add a language in the 'Misc' menu under 'Languages'. Simply use the drop-down menu to select between the available languages.
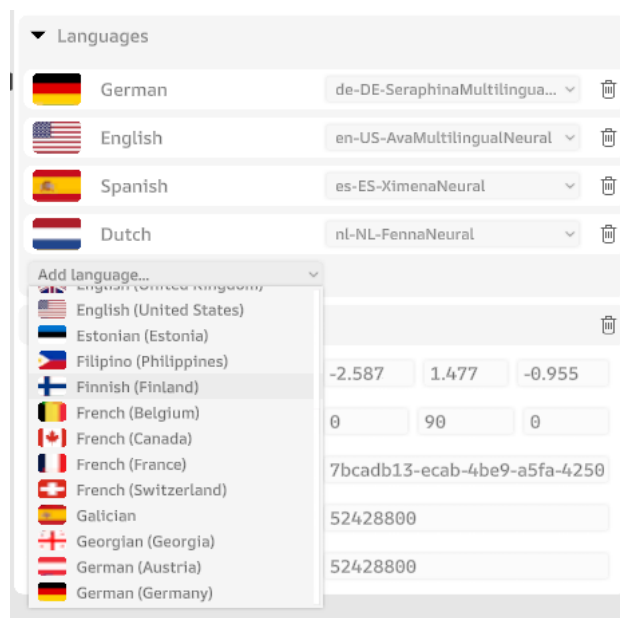

Figure 12: Add a new language

Once a new language is added to the Procedure, the user will have to go through all Steps and add guidance text for the new language. To do this navigate to the individual Steps, click on the flag representing the newly added language, write the guidance text, and press the 'Play' button to generate the corresponding voice guidance and get an instant preview.
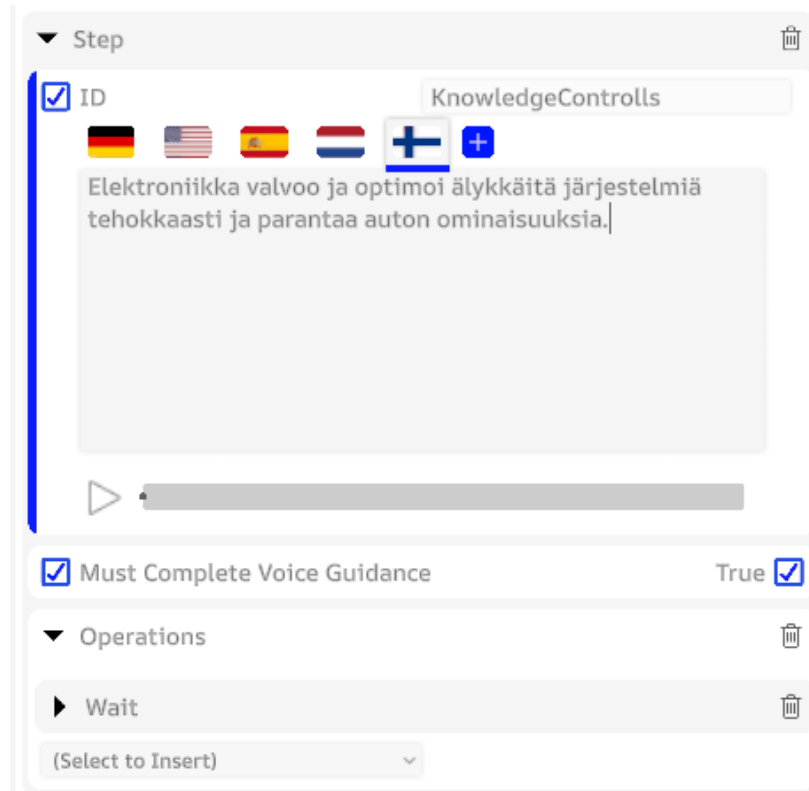

Figure 13: Define guidance text for each language in Step

This must be done for all Steps where text and voice guidance is used to fully support the newly added language.

8.2 Change voice

It is possible to choose between several different voices to be used for the voice guidance generation. Under the 'Misc' menu, under 'Languages' use the drop-down menu to select between the available voices for each language.
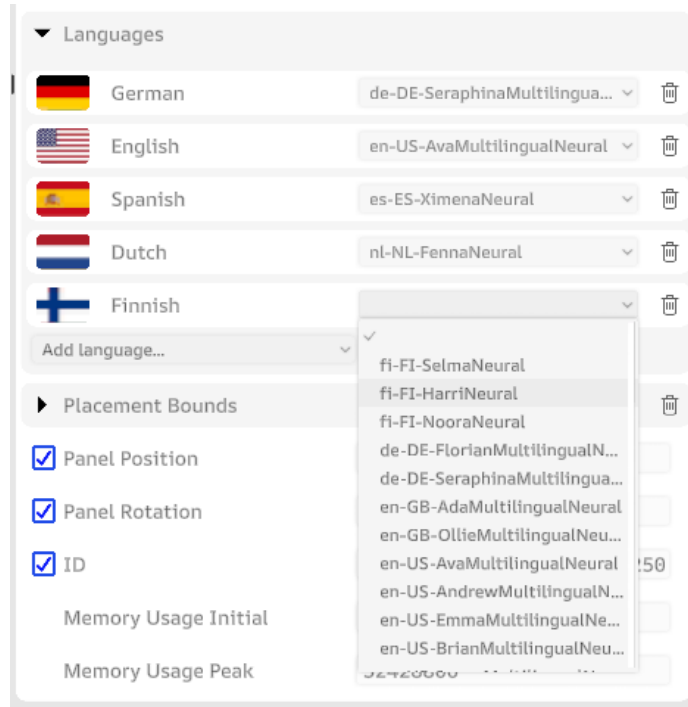
Figure 14: Select custom voice for each language

To get a preview, navigate to a Step, make a minor change to the text guidance, and press 'Play' to generate the corresponding voice guidance using the newly selected voice.

SYNERGY**XR**