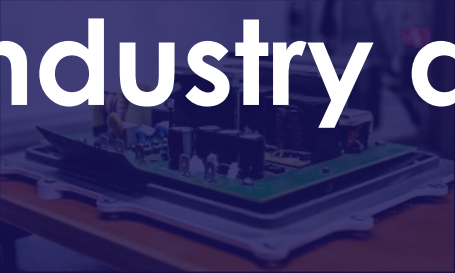


# Virtual Reality for Industry and Space

MS 4 Final Presentation

Martin Klima, Kristopher Blom

Item Info.



Item Number : AWER-PIE-129  
Quality : 30 pieces

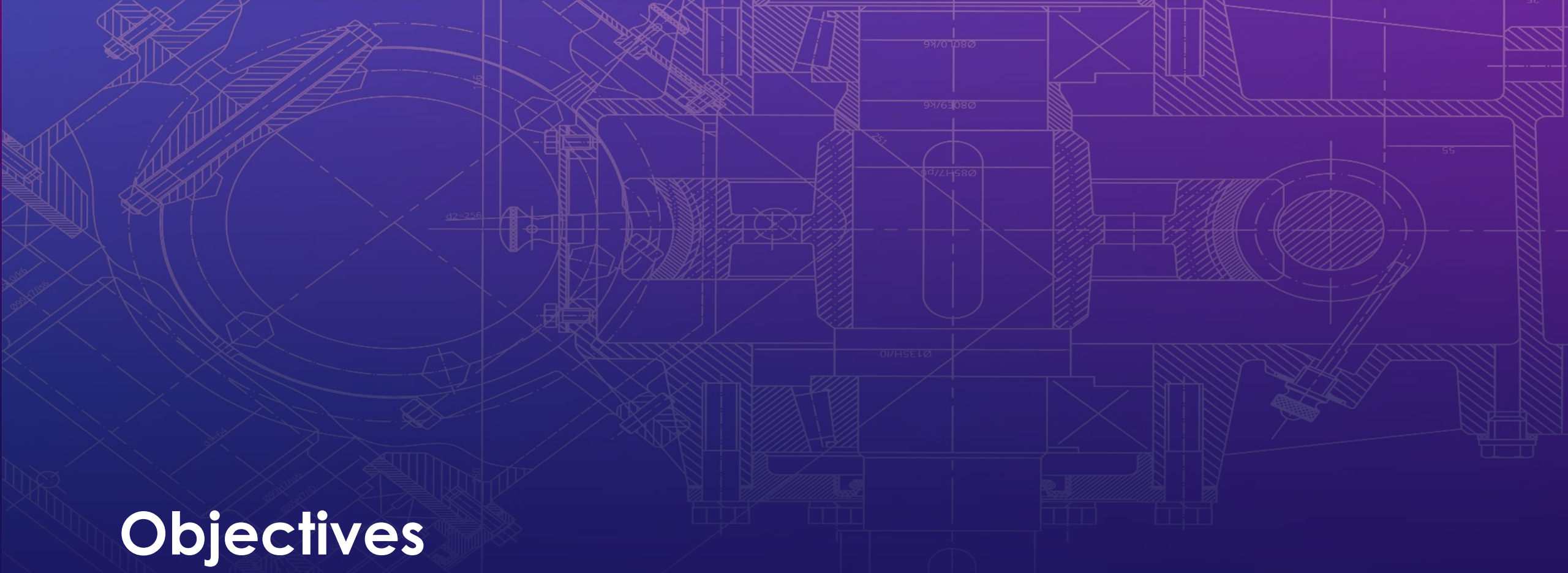


Augmented  
Reality



# Project Facts

Project name	Virtual and Augmented Reality for Industry and Space (VARlaS)
Contract No.	4000134981/21/NL/MH/kdj
Contractor	Misterine s.r.o., Czech Republic (MIS)
Project start	June 2021
Project duration	21 month + 3 extension
Project supervision	ESA

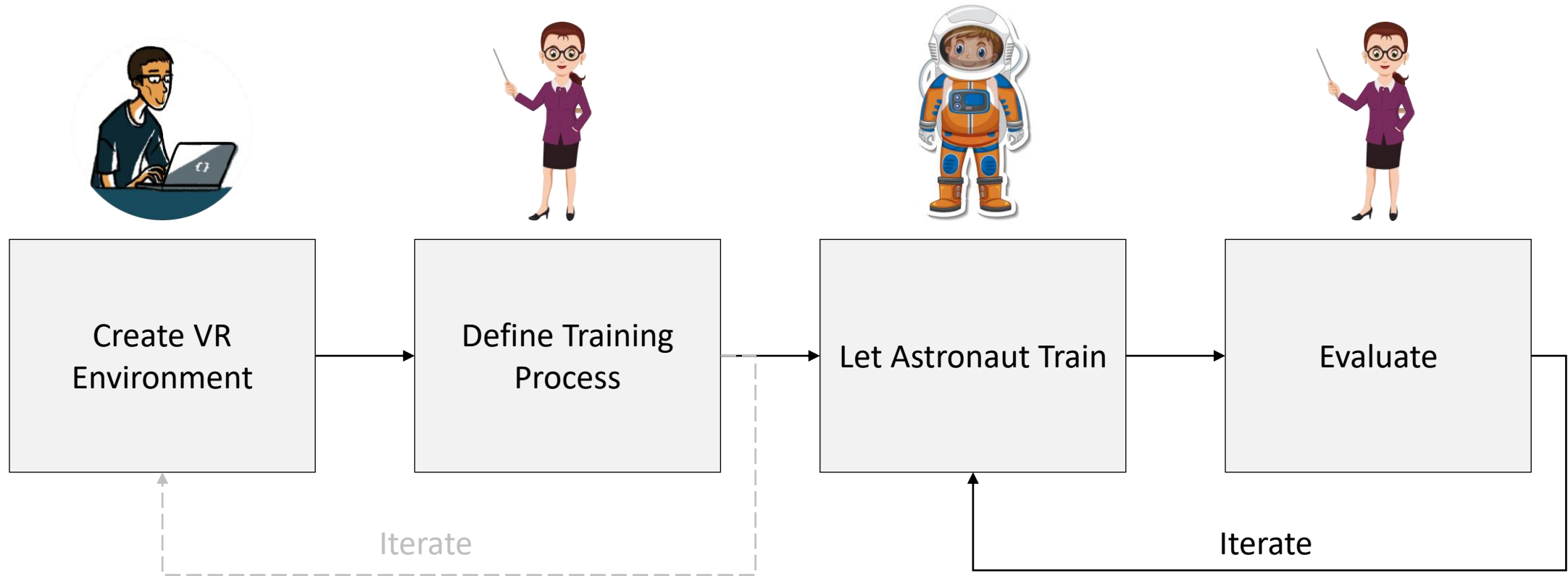


# Objectives

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# VR Training - activities

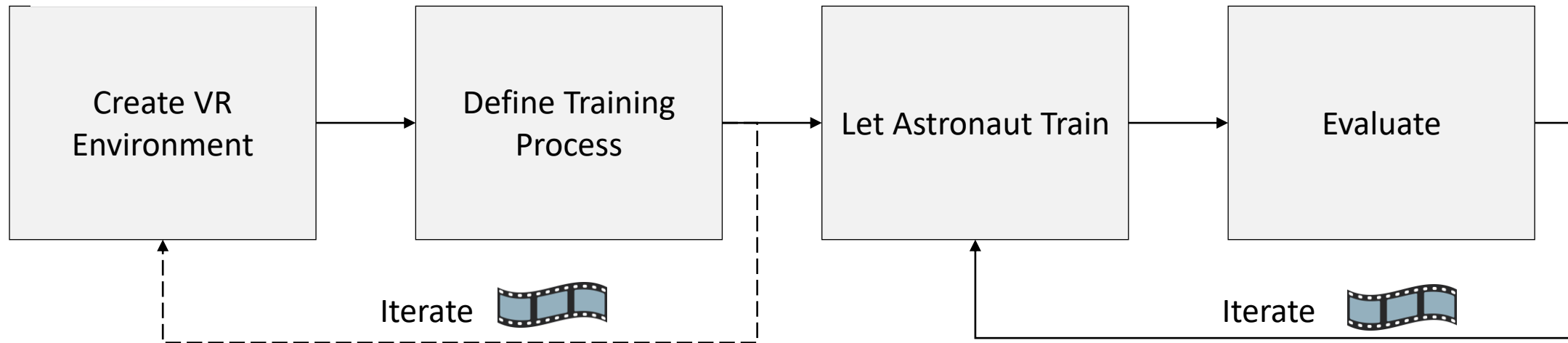
Typical workflow





# VR Training - activities

VARlaS workflow



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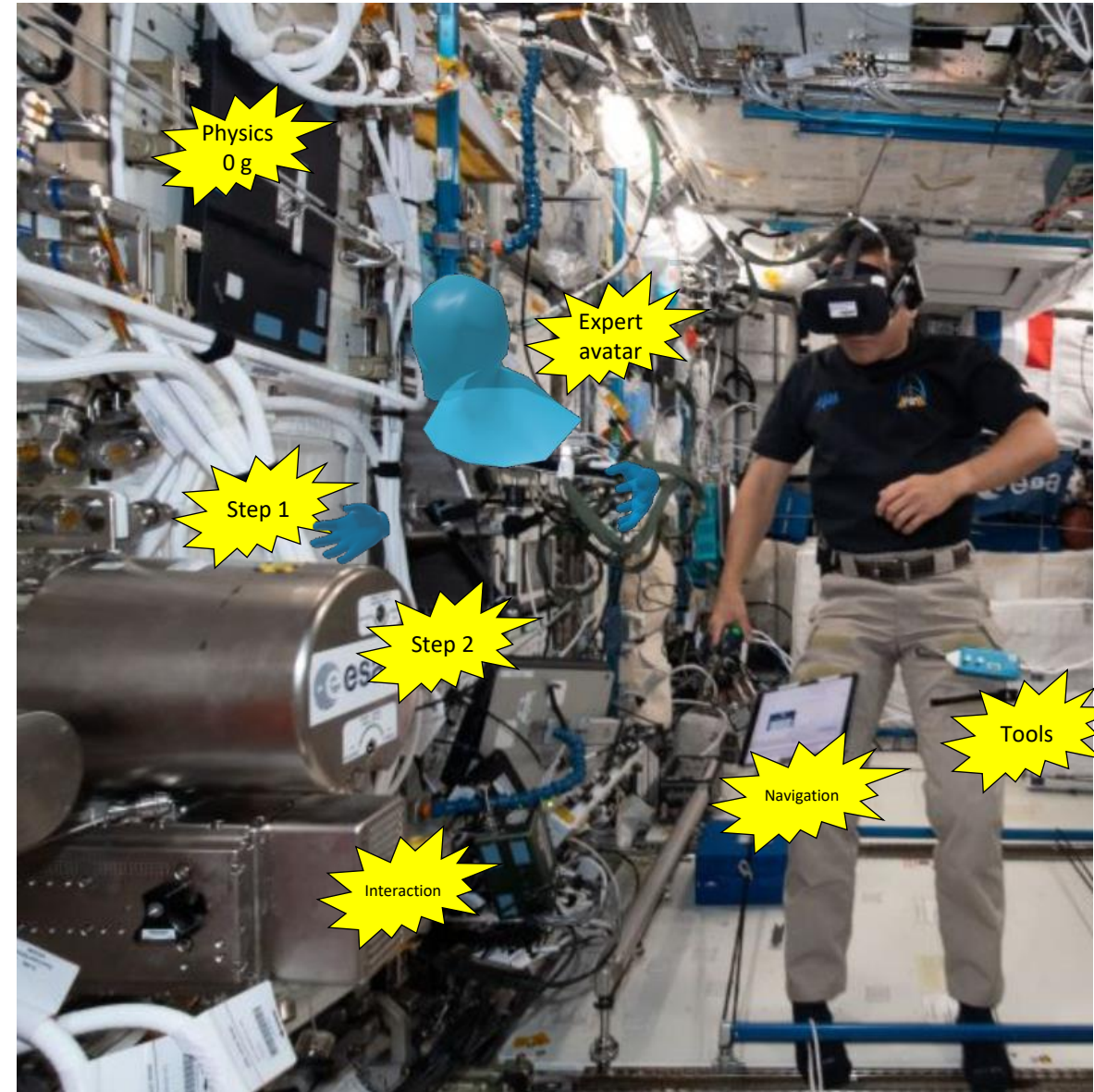
# Scenarios

## Training and re-training of procedures

- In VR environment
- Maintenance
- Step by step
- Using tools, materials
- With or without expert avatar
- Microgravity
- Voice and laser pointer with expert observers

## Major use case

- Life Support Rack maintenance

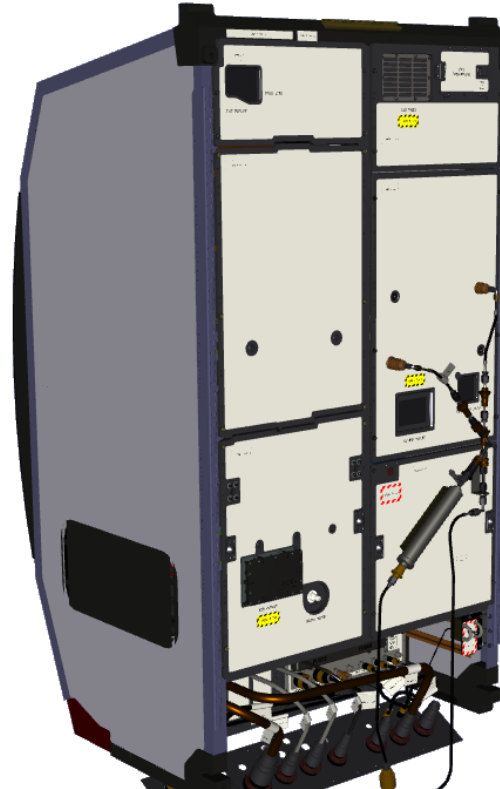


# Scenario LSR reality and model

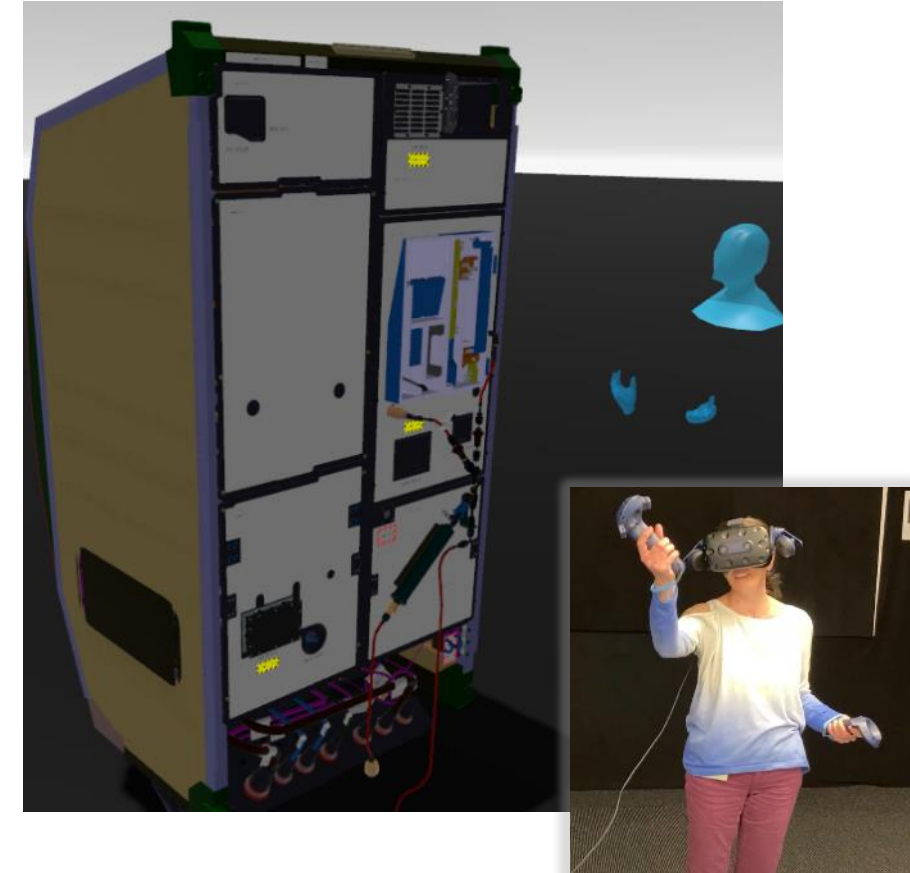
Reality



Model in VR Studio



Interactive session in VR

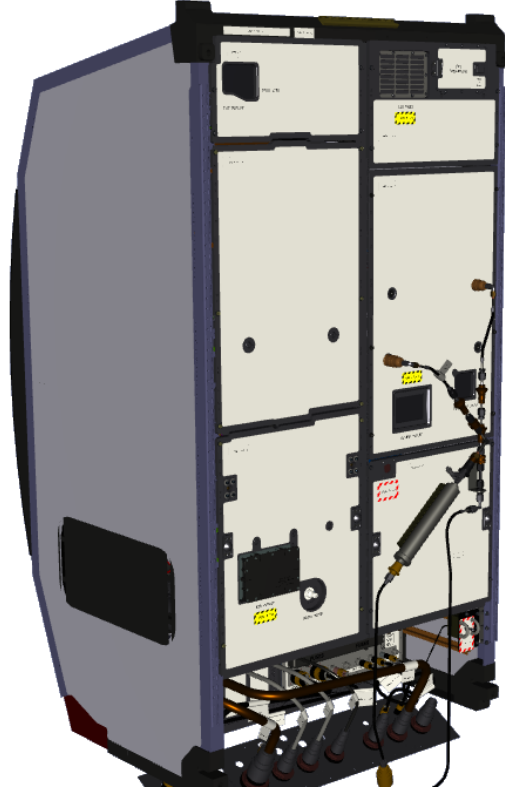




# Model Behavior

Easy to define in VR Studio

Starting state



State automaton defining:

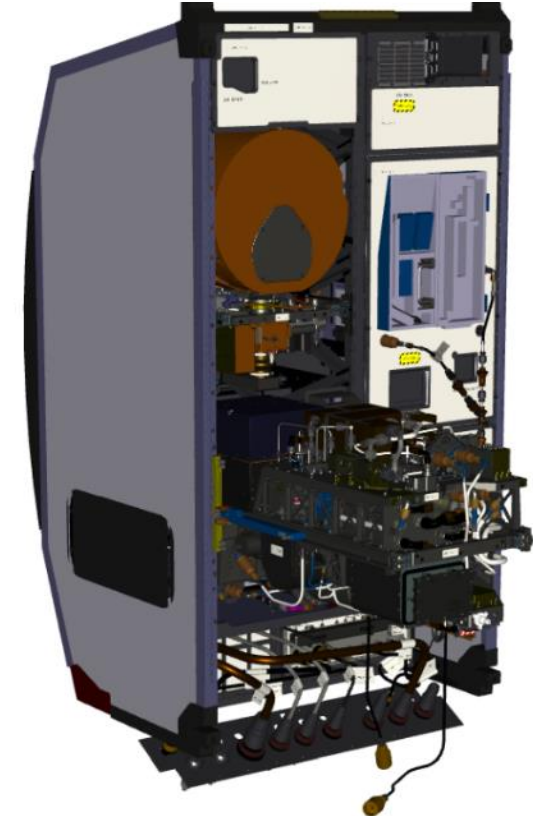
- Position (move, rotate, scale) limitations
- Response to actions
- Animations
- Triggers of actions
- Ready for:
  - Controllers



- Gloves



Servicing state



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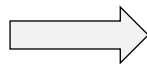
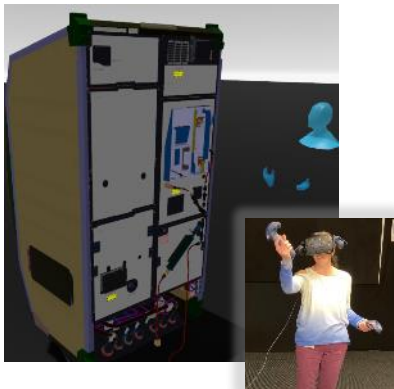


# Define process by doing

Role: ESA Expert, Editor, Trainee

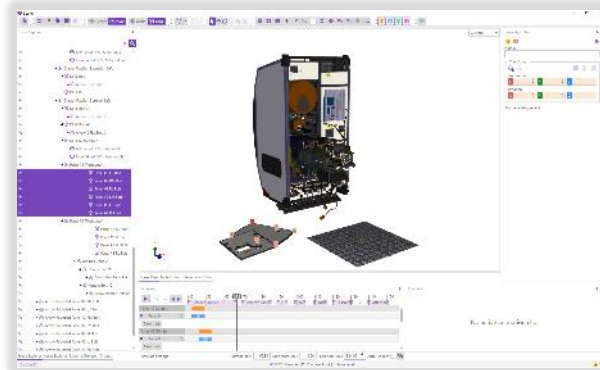
## ESA Expert

- Executes process
- Process is recorded
  - All changes in the environment
  - Expert's movement = Avatar
  - Voice instructions



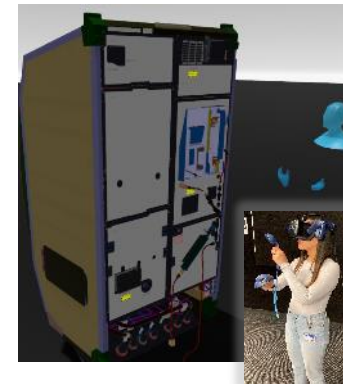
## Editor

- Loads the saved session
- Splits the session into steps
- Modified and adds instructions



## Trainee

- Loads a tutorial
- Follows the instructions
- Follows Expert's avatar
- All gets recorded again
- For later evaluation

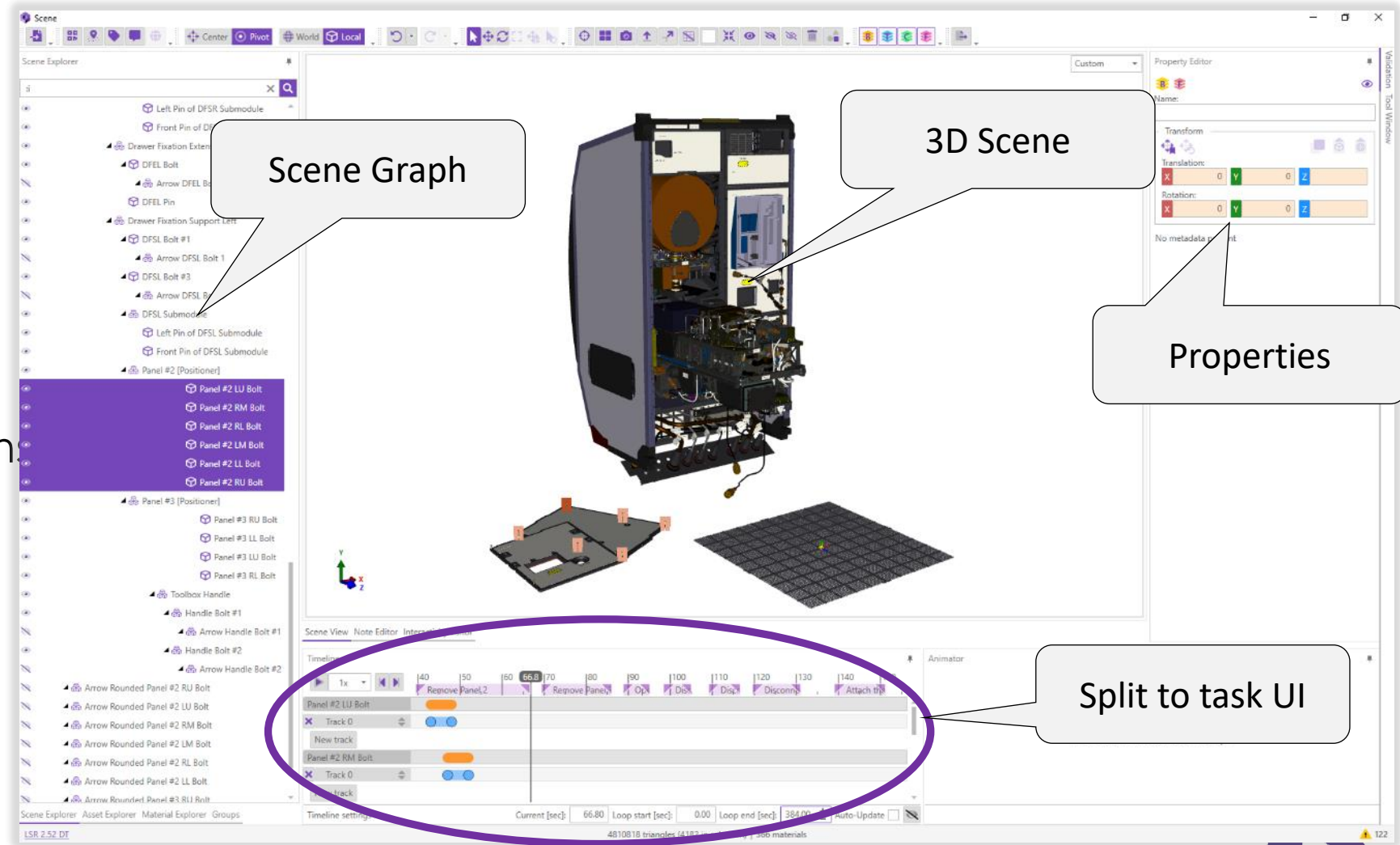


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# Editing a Recorded Session

## VR Studio

- Loads a saved session
- Semi-automatically splits it to tasks
- Adds texts, instruction animations
- Exports to VR
- Exports to AR



# Results and Evaluation

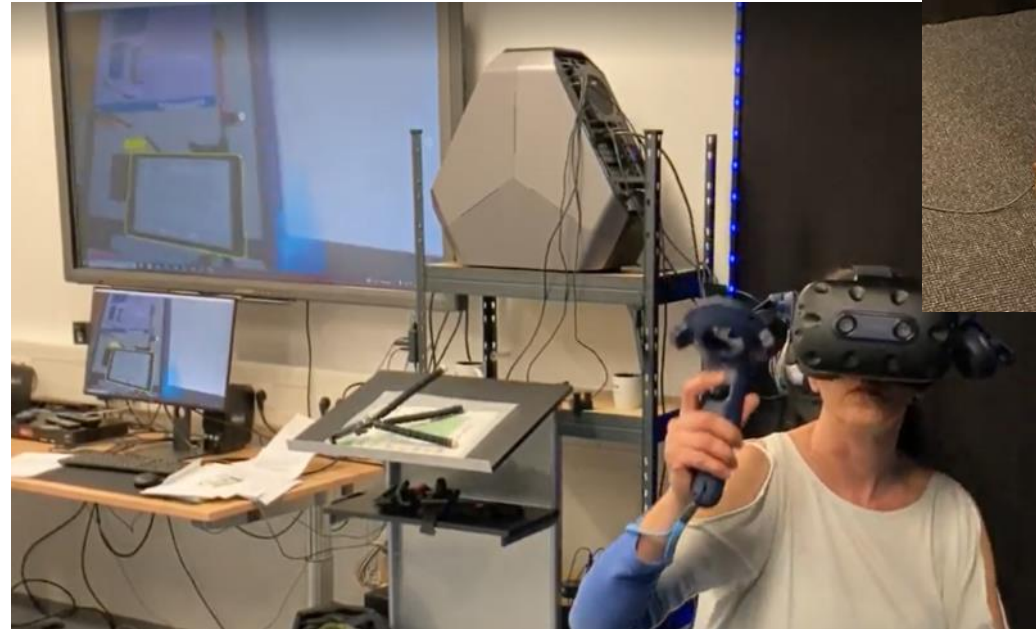
- TRL level 5 reached
- Controllers and gloves implemented
  - the Hi5 gloves did not work properly
  - the SenseGlove Nova worked well (subject of project extension)
- Both VR Studio and VRIPR tested on multiple users
- Positive feedback from ESA



# User Testing at ESA (M20)

## Roles covered

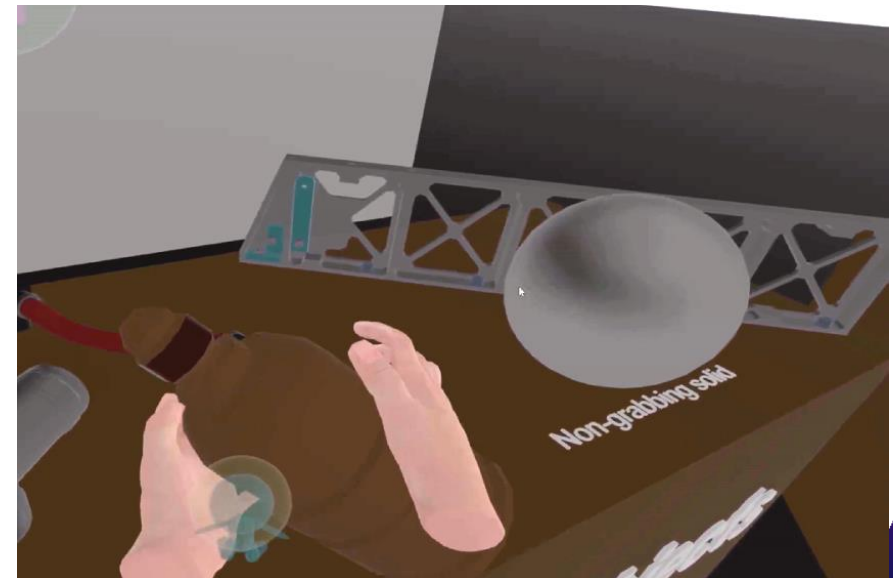
- Editor
- Expert
- Trainee





# Project Extension Goals

- Implement force-feedback gloves in VRIPR
  - SenseGlove Nova
  - Grasp force feedback via strings
  - Vibrations
  - Wireless communication
- Add new functionality to Studio
  - Hoses and flexible objects
- Add new features to VRIPR
  - Two-handed object manipulation
  - Switch from UnityXR to SteamVR plugin
  - Added tablet to see tasks in Trainee mode
  - New menu – full redesign



# Conclusions

- The tool is very promising
- ESA to adopt the tool for VR training
- Gloves – not really great
  - Hi5 gloves – no success, bad drivers, small size
  - SenseGlove Nova – better but not a unicorn
- Major struggle:
  - Definition of the environment
- Next steps
  - Make the environment definition easy
  - AI



A detailed technical drawing of a mechanical assembly, likely a pump or engine component, rendered in white lines on a dark blue background. The drawing includes various parts, dimensions, and hatching to indicate different materials or sections. Dimensions such as 99/70.080, 99/63.080, 251, 01/H5E10, 085H7/p6, 55, and d2=25.6 are visible. The drawing is a cross-section showing internal components and their assembly.

**Thank you for your attention**

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Team Misterine