Deliverable M04

RoboXR SCENE – VIROO

LINK : https://virooportal.virtualwareco.com/content/f/387410

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Contents

RoboXR OC2 – XR Multi-Cell Production Scenario

The learner enters a modern industrial production hall where three robotic tending cells operate in parallel. The environment reflects a realistic manufacturing setup with clear walkways, safety fencing, and structured material flow.

Each robotic cell includes:

- A 6-axis industrial robot
- A configurable process machine (injection moulding, CNC, or milling)
- Infeed and outfeed conveyors
- Palletized material
- Safety fencing and emergency stop systems

The three cells are intentionally arranged with different entry and exit configurations:

- Opposite sides (central alignment)
- Opposite corners
- Same-side U-flow

This allows learners to observe how layout decisions affect accessibility, safety, and workflow efficiency.

Material movement is supported by:

- Conveyor belts within cells
- AGV/HGV units transporting parts between cells

Safety is visibly integrated into the environment through:

- Restricted and warning zones
- Clearly marked operator areas
- Emergency stop devices
- Controlled access gates

The scenario supports two key learning layers:

- **Layout planning (AAXLP):** adjusting cell configuration, visualizing reach zones, and evaluating material flow.
- **Operational execution (REACH):** performing a structured machine tending cycle with state validation and error handling.

Learners may assume different roles — installer, operator, or safety supervisor — within the same unified production hall.

Industrial-Level Integration – Connection to VORAUS System

The XR environment is not limited to visual simulation. It allows connection to the **VORAUS industrial automation system**.

Through integration between **VIROO and VORAUS via WebSocket communication**, the system enables:

- Bidirectional communication between XR and the industrial control layer
- Transmission of robot state data (e.g., joint angles, process states)
- Sending motion commands and control signals
- Synchronization of robot processes with industrial-level logic

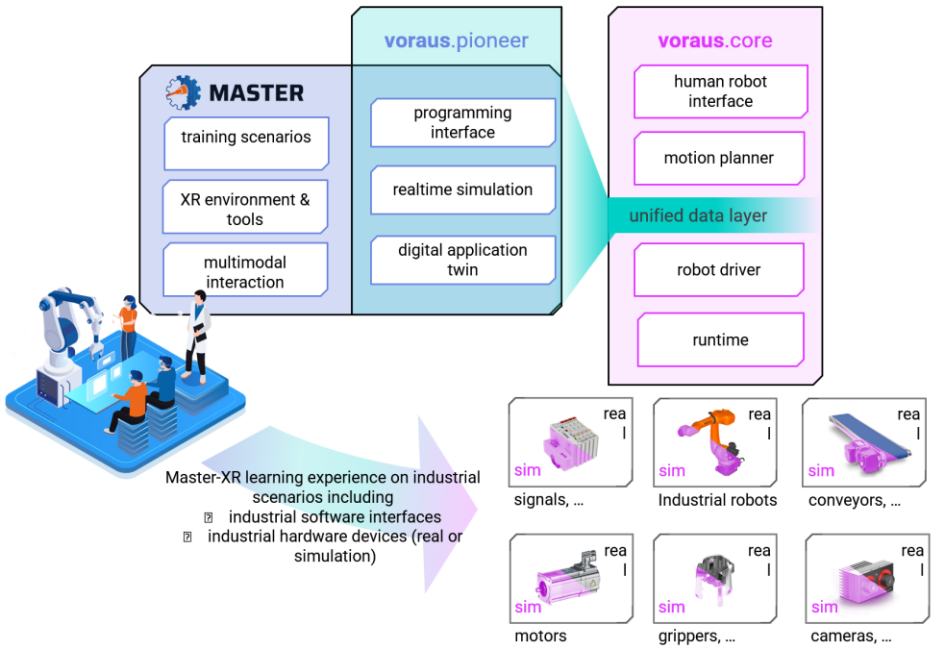
This WebSocket-based interface allows:

- Real robot control from the XR environment
- Industrial process monitoring inside XR
- Integration with higher-level automation systems

As a result, the RoboXR environment can operate in two modes:

- **Simulation mode** (training-focused)
- **Industrial-connected mode** (live process integration)

This connection transforms the environment from a standalone XR training scene into a software-driven automation interface capable of interacting with real robotic systems.



Scenario 1 – XR Layout Planning (AAXLP)

Objective:
Develop spatial reasoning and safe industrial layout configuration skills.

Activities:

- Compare three cell entry/exit configurations.
- Adjust robot, machine, and conveyor placement.
- Visualize robot reach and safety zones.
- Evaluate AGV path routing and workspace clearance.

Outcome:
Learners understand how layout decisions affect safety, accessibility, and workflow efficiency.

Scenario 2 – Robotic Machine Tending (REACH)

Objective:
Execute a correct machine tending sequence using structured operational logic.

Activities:

- Verify machine readiness.
- Perform robot load/unload cycle.
- Monitor machine state.
- Transfer finished part to conveyor or AGV.
- Respond to incorrect sequencing.

Outcome:
Learners develop procedural accuracy and operational awareness.

Scenario 3 – Safety & Human–Robot Interaction

Objective:
Identify risks and apply safe interaction principles in a robotic cell.

Activities:

- Detect restricted and warning zones.
- Observe speed reduction and stop behaviors.
- Activate emergency stop.
- Respond to human entry and AGV conflicts.

Outcome:
Learners understand safety fundamentals and hazard mitigation principles.

APPENDICES

EDUCATIONAL SCENES for 3 different scenarios

- In this setup we have 3 different CELLS

The image shows a **realistic XR industrial production hall** viewed from outside a fenced robotic cell. The perspective places the observer at operator level, looking through a metal safety enclosure into a multi-cell robotic environment.

Inside the fenced area:

- A **6-axis industrial robot arm** is positioned on the left, mounted on a fixed base.
- On the right, a second industrial robot is visible inside another cell.
- Multiple **orange AGV/HGV units** are distributed across the floor, suggesting mobile material handling.
- Pallets and stacked boxes indicate raw and finished material flow.
- Vertical metal fence posts with mesh panels clearly define restricted safety zones.
- Light columns near fence posts appear to simulate industrial safety lighting.

The safety fence in the foreground emphasizes:

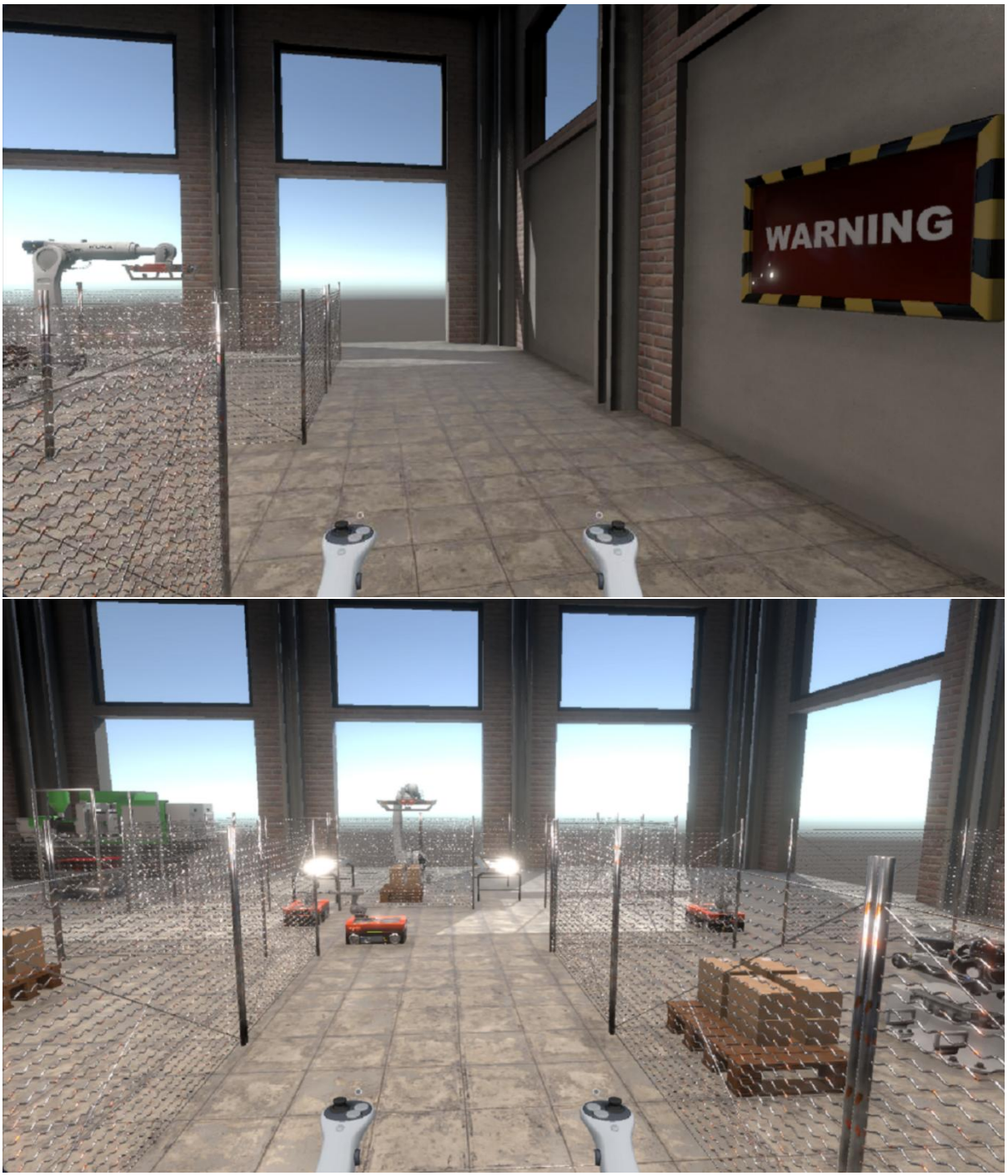
- Physical separation between operator and robot workspace.
- Traditional safeguarded automation rather than open collaborative robotics.
- Controlled access through gated entry points.

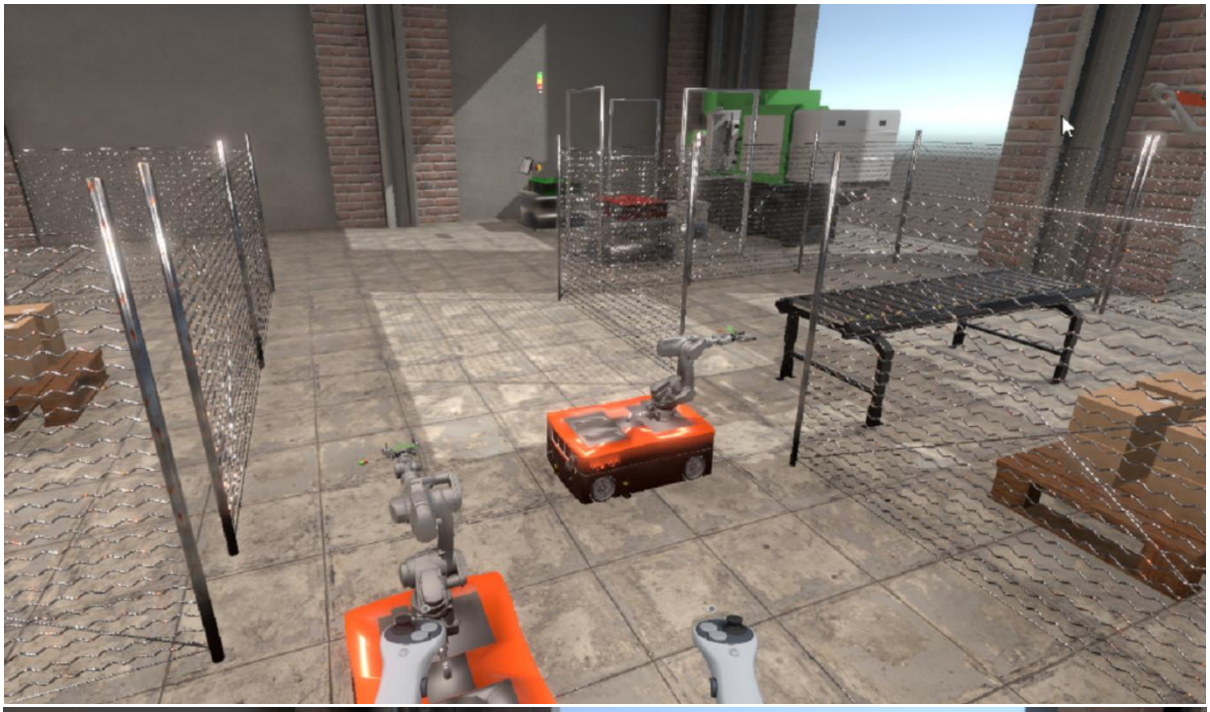
The overall layout reflects a **multi-cell robotic tending setup**, where each cell operates independently but shares a common industrial hall and logistics infrastructure.

The environment communicates:

- Structured production workflow
- Clear material handling pathways
- Separation of human and robot spaces
- Industrial realism in scale and proportions

It resembles a small distributed manufacturing unit rather than a single demonstration cell, supporting both layout planning and operational training scenarios within a realistic factory context.





Connecting with VORAUS system

This allows the robots to be controlled via the VORAUS system

- Using VIROO to connect to VORAUS system via WEBSCOCKET
- Through this WEBSCOCKET we can have biderectional communication with the robot thus giving us the opportunity to have actual control and robot processes from and industrial level system

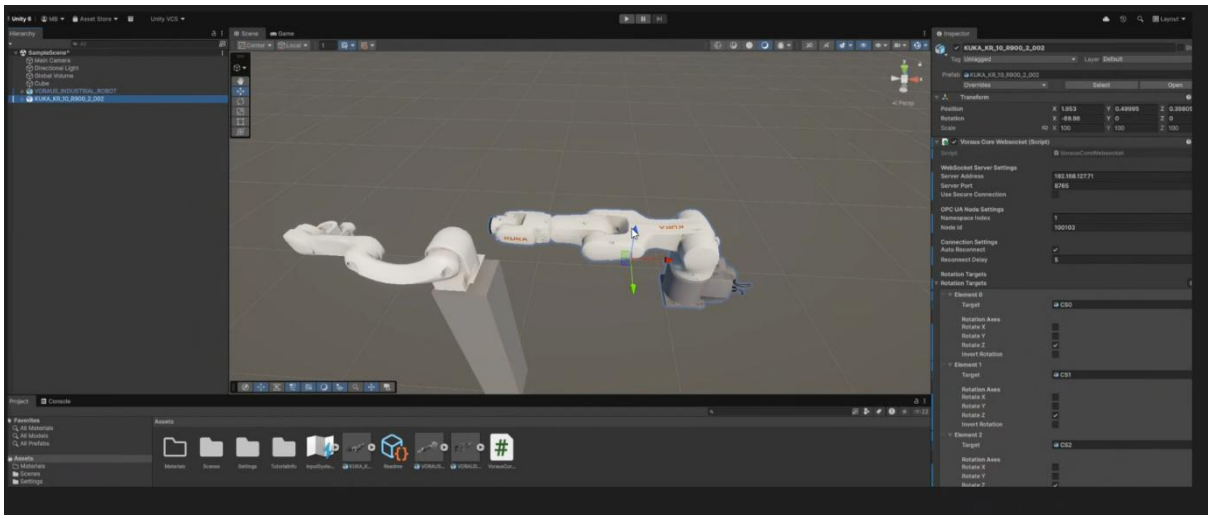


Figure1: The robot is controled via industrial level system

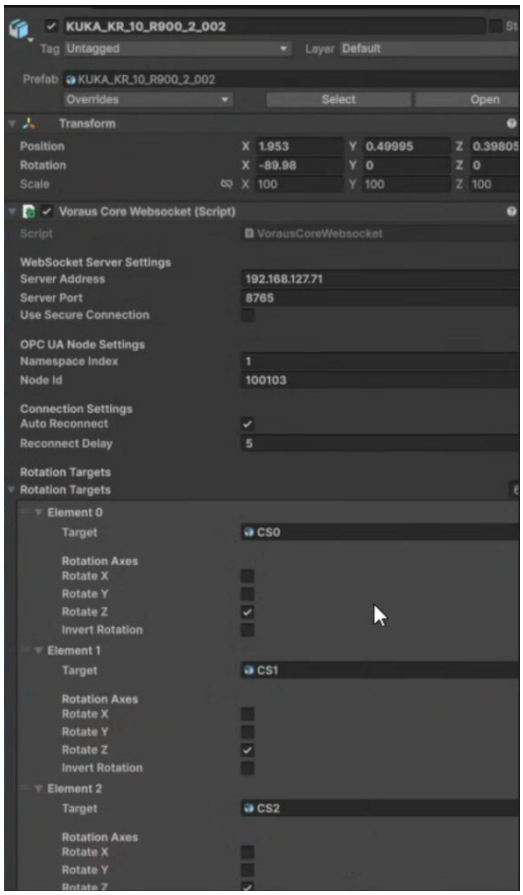


Figure 2: Configuration of websocket with the VORAUS system