

Remote, digital assistant and training system

REDIA

Victor Murillo Miras – Skylife Engineering S.L. – victor.murillo@skylife-eng.com

Alberto García Sánchez – Skylife Engineering S.L. – alberto.garcia@skylife-eng.com

David Rocha Cerezo – Skylife Engineering S.L. – david.rocha@skylife-eng.com

Keywords: Telepresence, Remote Assistance, Digital Assistance, Virtual Simulation, XR Platform

Introduction

Telepresence technologies are redefining the way humans interact with each other and with automated systems by merging physical and virtual environments to enable immersive and collaborative experiences. These capabilities hold great potential across industrial sectors, where enhanced coordination, remote accessibility, and contextualized visualization can significantly improve productivity and operational efficiency. However, widespread adoption remains limited due to technical complexity, infrastructure requirements, and high integration costs.

One of the most pressing challenges in industrial contexts is the need to reduce training costs, overcome geographical barriers, and enhance knowledge transfer among operators. Immersive telepresence offers a promising solution to these limitations by enabling remote, realistic, and collaborative learning experiences.

In response to this need, REDIA (Remote, Digital Assistant and Training System) proposes a transformative approach to industrial training. Through Skylife ULTIMATE, REDIA delivers an innovative remote and multiplayer training platform based on extended reality technologies, allowing operators and technicians to acquire technical skills in highly realistic simulated environments—without the need for physical presence and with full scalability.

Objective

The main objective is to develop and validate a multiplayer XR training framework that enables realistic remote interactions through full-body avatars and synchronized environments. This includes ensuring low latency, reliable voice communication, and compatibility with various XR headsets. The system must be adaptable for sectors such as aerospace, energy, and manufacturing, providing safe and efficient training while reducing time and cost. Additionally, the framework should support future extensibility, including avatar expressiveness, biometric inputs, and integration into mixed reality workflows.

Methodology

The solution architecture is based on Unity 3D, leveraging XR hardware (Meta Quest 3, and Pro) and key open-source tools. FishNet handles client-server networking with deterministic synchronization, while Dissonance provides low-latency spatialized audio. Initial tracking solutions using inverse kinematics were limited in realism, prompting evaluation of Meta's Movement SDK. The SDK was tested in isolated scenarios for OpenXR compliance and then integrated into ULTIMATE with custom adaptations for posture correction, object interaction, and scene transition stability.

A multiplayer scenario was implemented replicating a real-world workspace, where two users—an operator and an expert—collaborate remotely to diagnose and solve simulated technical issues. The virtual scene includes interactive objects, animated systems, and contextual visual aids. Server and client applications are deployed independently to test network performance across environments.

Results

Validation was conducted across three deployment scenarios: (1) local network, (2) TESTBED-to-TESTBED between University of Surrey and Berlin, and (3) cloud-hosted on AWS. Metrics collected include Round-Trip Time (RTT), jitter, avatar sync stability, and perceived audio quality.

Across all conditions, avatars exhibited fluid and natural movements. Object manipulation remained synchronized between users, and voice communication was uninterrupted and spatially coherent. Figure 1 shows the different RTT responses for each of the scenarios, and Figure 2 shows the jitter results across the different environments, illustrating the variability in packet arrival times and its impact on synchronization performance.

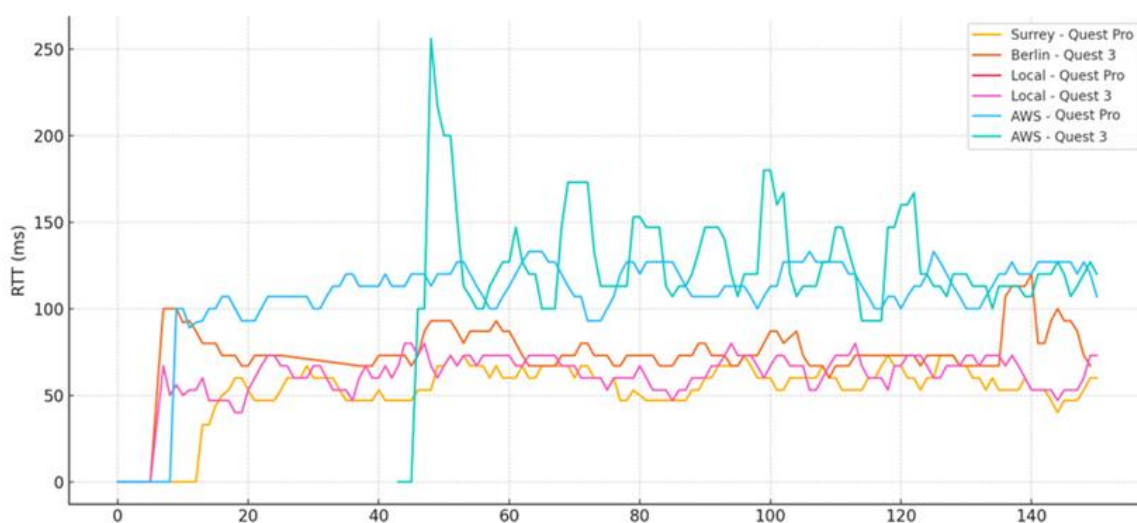


Figure 1. RTT measurements across different environments

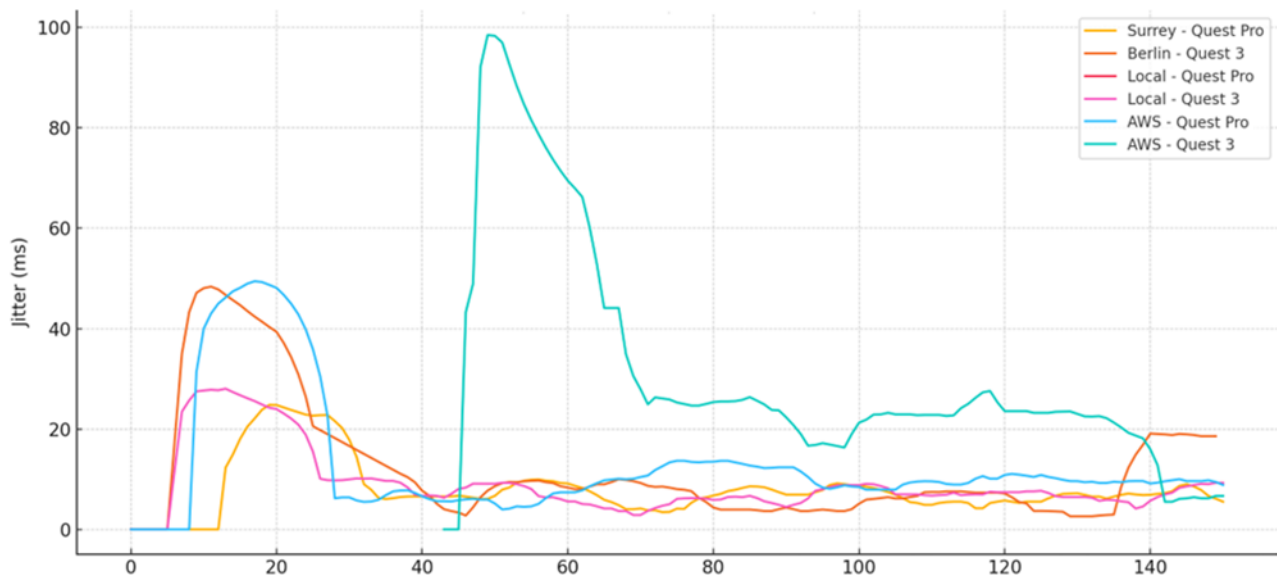


Figure 2. Jitter measurements across different environments

Discussion and Conclusion

The integration of the Meta Movement SDK into the ULTIMATE platform significantly enhanced user immersion and body representation quality. Networking tools such as FishNet and Dissonance proved effective in maintaining consistency across users and environments, even under variable latency conditions. The training scenario successfully replicated realistic technical procedures in XR, enabling meaningful collaboration at distance.

This implementation positions ULTIMATE as a scalable and future-ready XR platform for remote training. Future work includes improving avatar expressiveness (e.g., facial animation, gesture recognition), expanding authoring tools for instructors, and evaluating mixed-reality deployment constraints in real-world operational settings. The system aligns with Industry 5.0 principles by enhancing human-centric, data-driven training ecosystems.