



Introduction

The SmartRoom develops an indoor sensing environment that can operate as a node within the CityOS architecture.

System combines:

RGB-D sensing	Action recognition
Audio capture	Spatial Localization
Time-synchronized camera capture	Centralized data, visually browsable interface

Purpose: determine **what happened, when it happened, and where it happened** inside a room while supporting privacy-aware data collection and release

Data Statistics

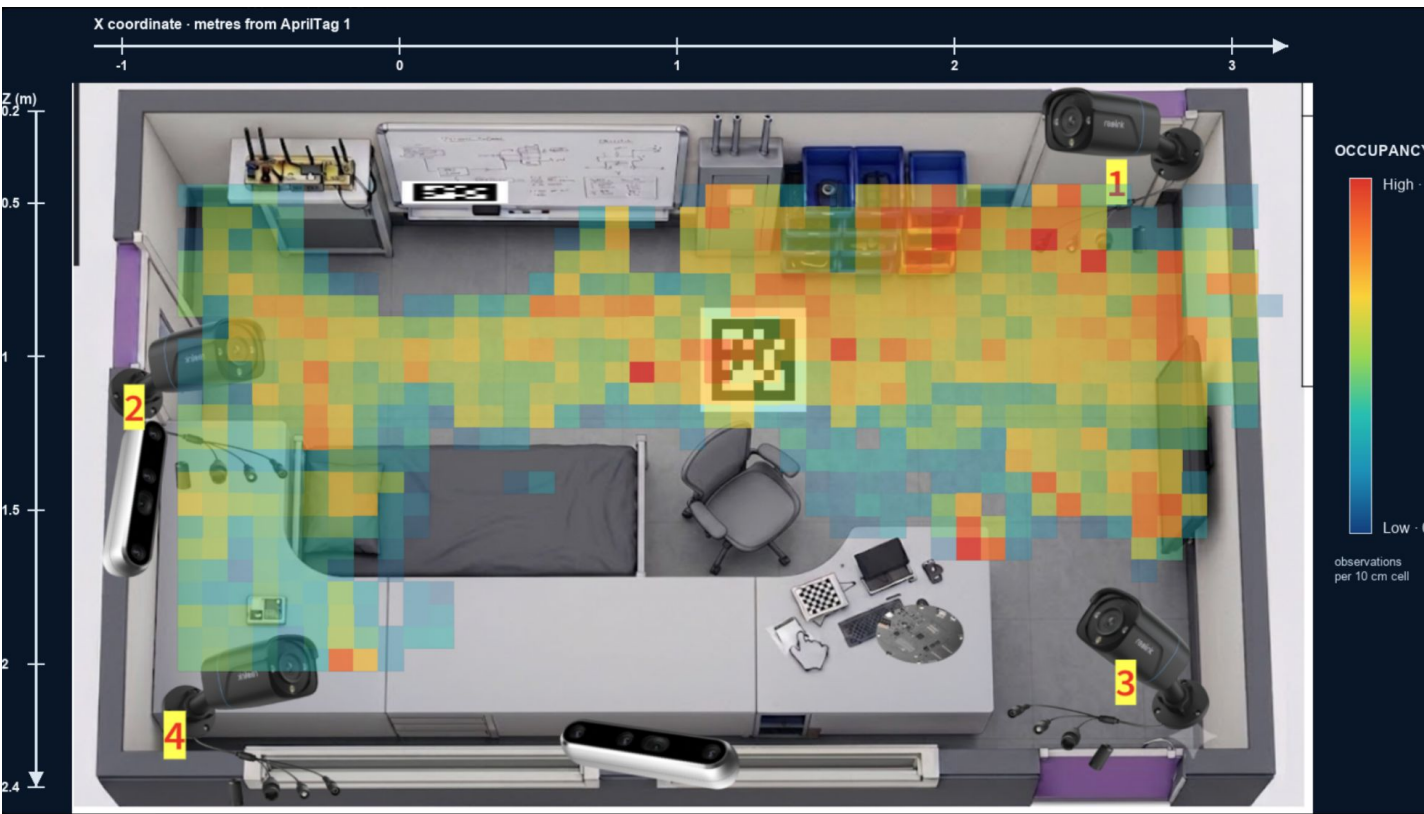


Figure 1: July 23 spatial distribution of geo-localized observations of SmartRoom → activity concentration

A heat map provides a top-down summary of **where people were located and how long they remained in each part of the room.**

Figure 2: security cameras compared for best backup audio

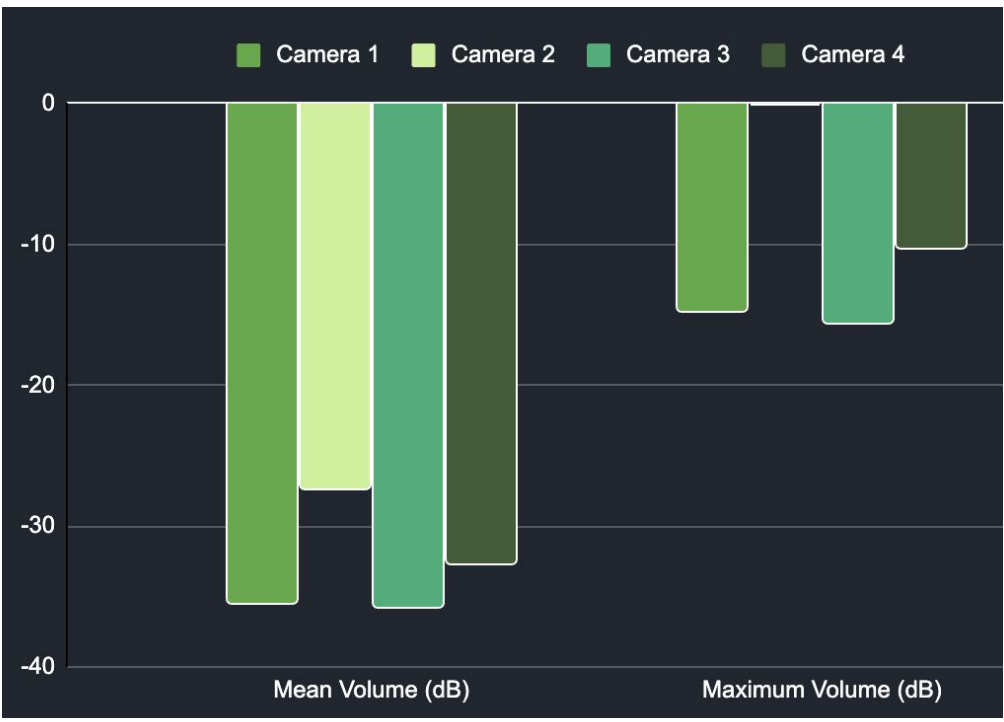
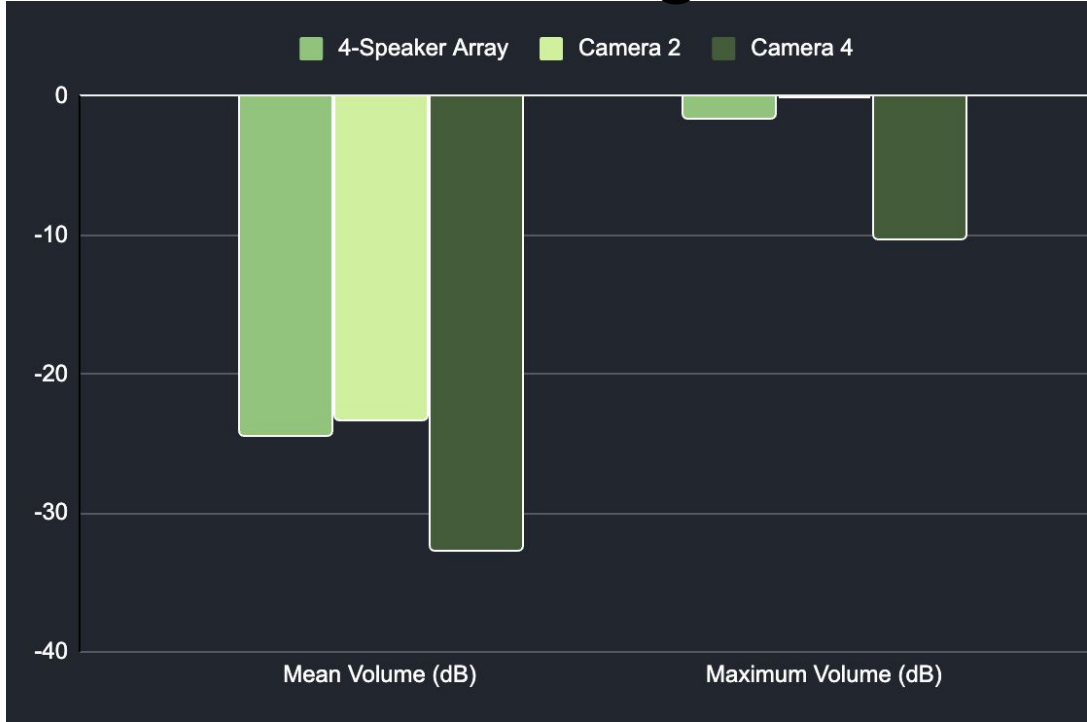


Figure 3: Camera 2 and 4 against main



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Smart Room Design

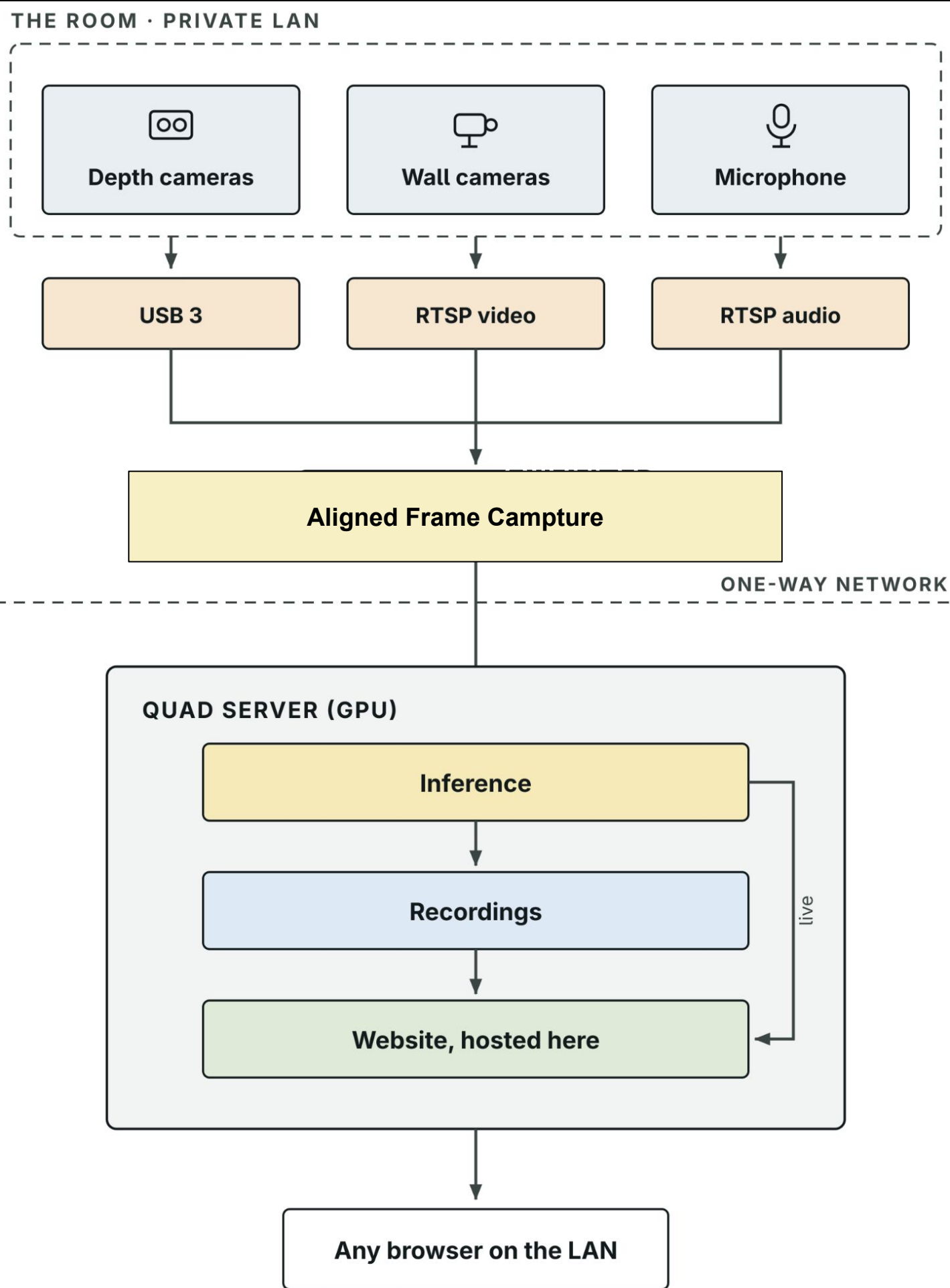
Sensors:

- 4 REOLink (RTSP via NVR; channel 1 provides the room's audio)
- Intel RealSense D455 + D435 depth cameras

AprilTags: every camera reports into one shared room coordinate frame.



System Architecture



Graphical Interface

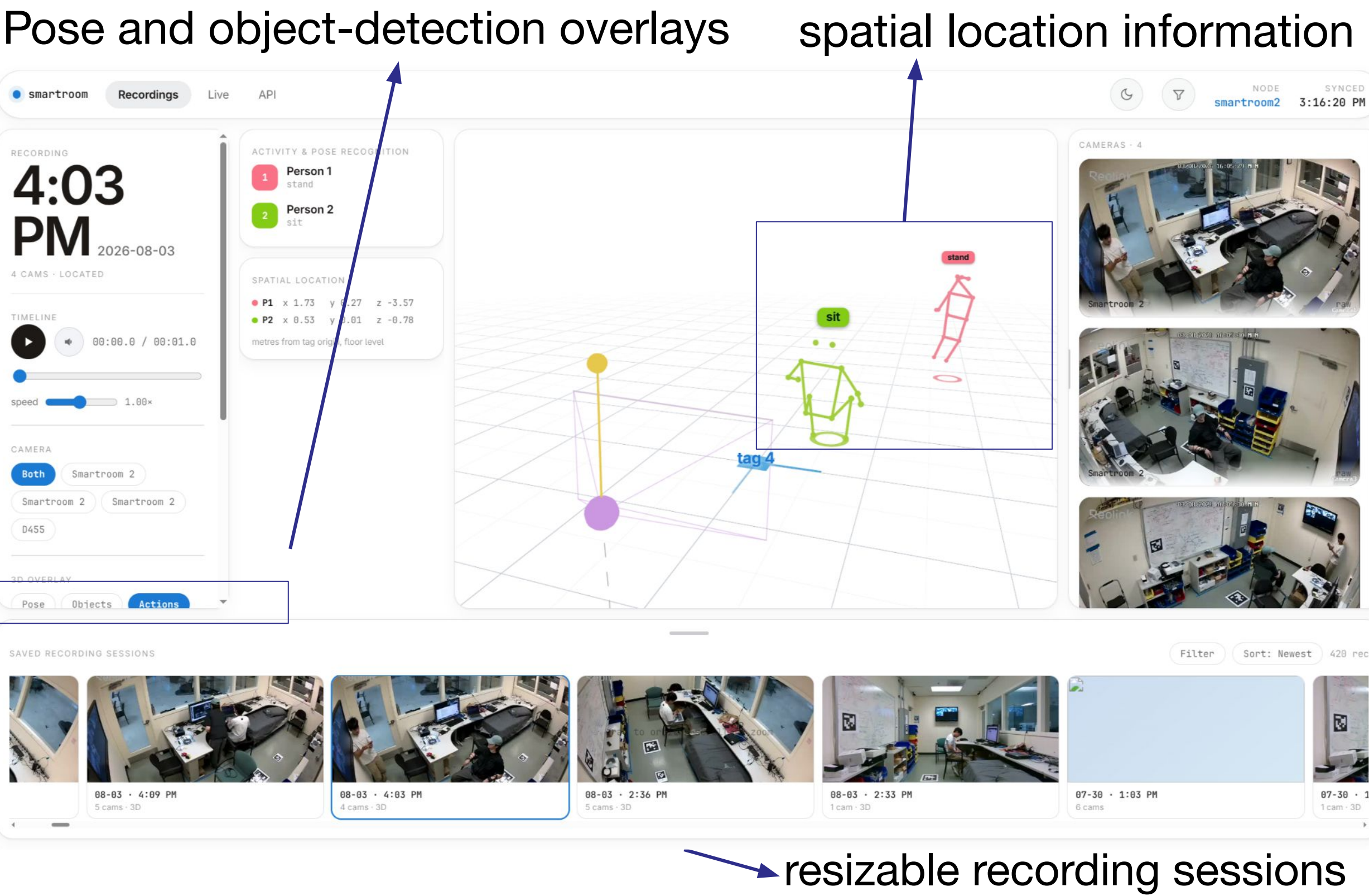


Figure 4: Smart Room interface that provides a central area for controlling the sensing system and reviewing collected data.

Data Samples



Image 1: Camera Stream

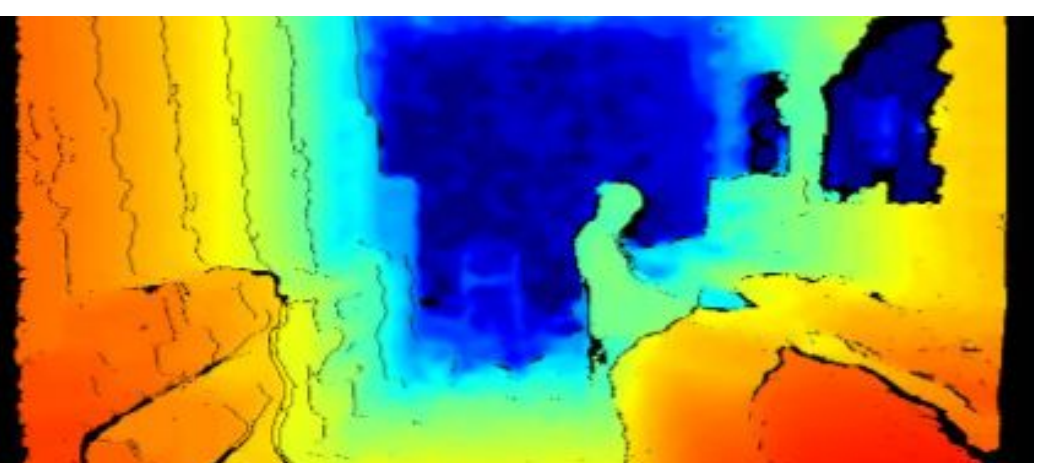


Image 2: Depth Location

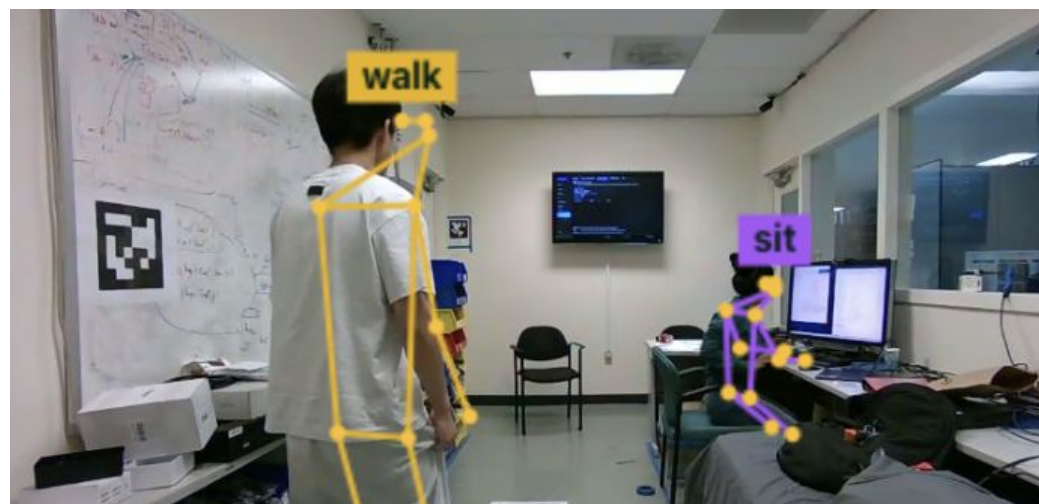


Image 3: RTM+PoseC3D label

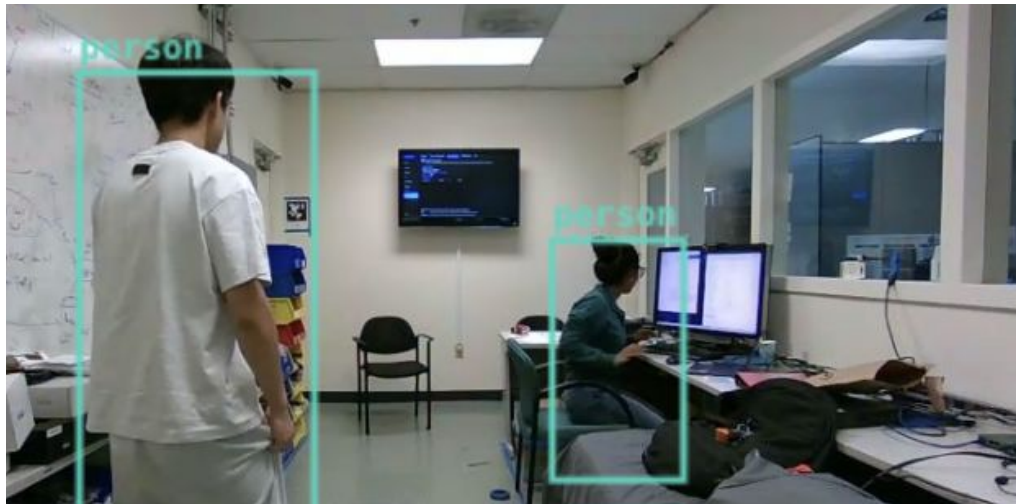


Image 4: YOLO Object Detection

Future Plans

- Collect more samples to evaluate performance
- Deploy CityOS privacy layer
- Improve multi-person tracking using OCsort components
- Enhance multi-camera fusion for spatial location estimation