

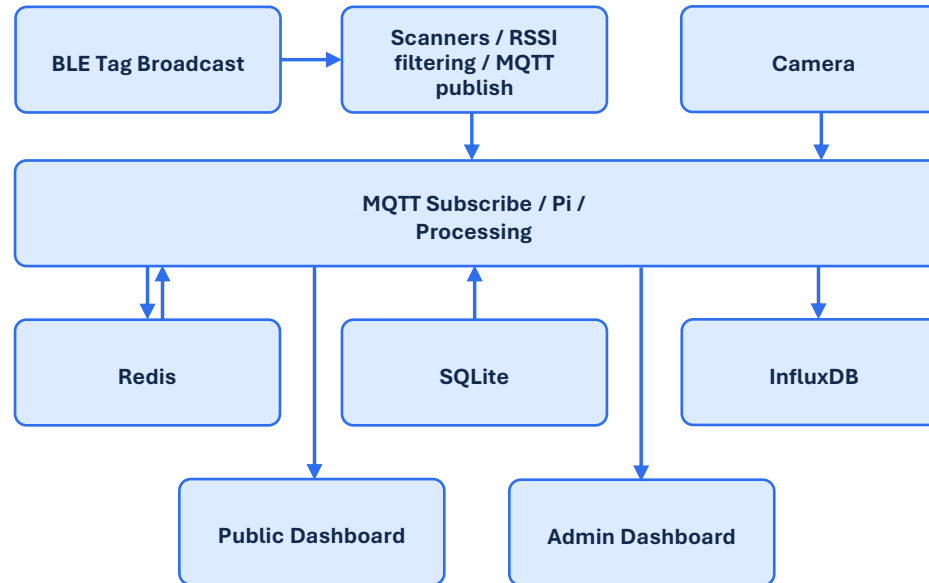
## Problem / Use Case

Offices with multiple rooms need a way to track employee presence and location, without relying on manual card scanning. OfficeSense detects user presence at room level using BLE tags, verifies identity via face recognition, and visualizes occupancy in real time, all while keeping personal data private by design.

### Key users / environment

Large office buildings with multiple rooms and employees, facility managers, security personnel, and system administrators.

## System Architecture / Data Flow



### Data path example

[User enters Room A] → [MQTT @ scanners/RoomA] → [Pi: SQLite lookup / Redis write] → [Dashboard]

## Main Components

Hardware: ESP32-C6 (tags), ESP32-S3 (scanners), RPi 4, USB Camera

Software: Node.js/TypeScript (Pi app), Go (face recognition binaries), ESP-IDF / PlatformIO (firmware), Node-RED (dashboard), AdminJS (admin panel)

Protocols: BLE, MQTT, HTTP/REST, NGSI-LD  
Storage: SQLite (persistent), Redis (real-time state), InfluxDB (movement history)

## Demo Scenario

A user carrying a BLE tag enters a room. Within seconds, they appear on the public dashboard with a pseudonymized name and their location. The camera verifies their face and the authentication status updates to “verified” live on dashboard. Moving to another room results in a live update of the user location and requiring a new face verification. When the user leaves the building and after some time, the user disappears from the public dashboard.