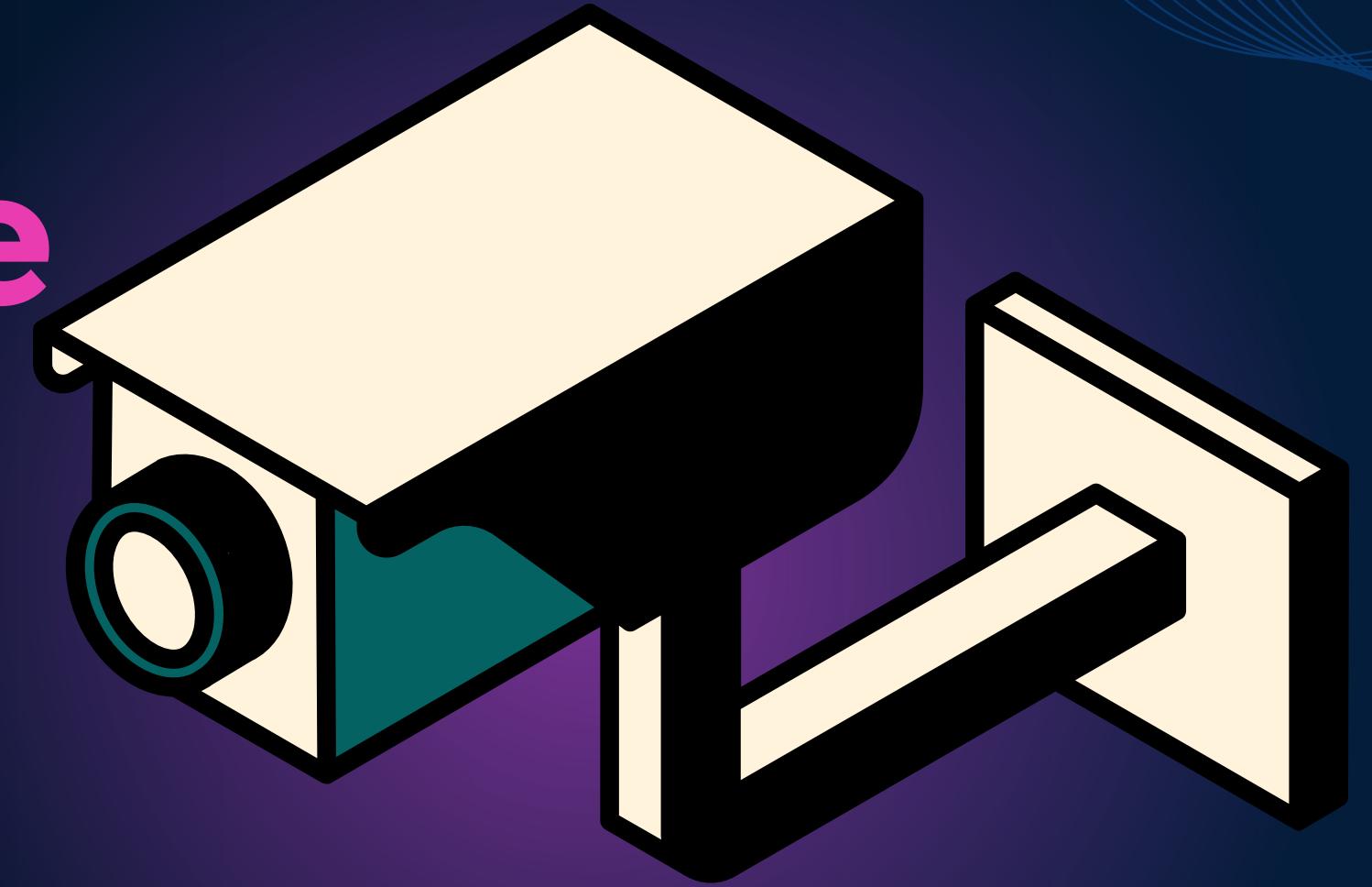


Smart Surveillance and Monitoring System

Using OneM2M



IIB20804 - IOT APPLICATION SECURITY

BACHELOR IN INFORMATION TECHNOLOGY (HONS.) (INTERNET OF THINGS)

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What is Smart Surveillance and Monitoring System?

IoT-based security system designed to monitor environments in real time, detect suspicious activities and alert users in residential or private areas.



Touch ID or Enter Passcode

0 0 0 0 0

1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ

Delete

Security Purpose of the System:

- Unauthorized access to camera
- Data leakage
- Weak authentication
- Insecure firmware

MORE



Objective

- To design and develop smart surveillance system using IoT technology
- To monitor residential or private area in real time using CCTV and motion captured
- To improve security by detecting suspicious activities and providing timely alerts to users
- To reduce the need for constant manual monitoring and increase user convenience

Hardware Components



Ultrasonic Sensor



ESP32-WROOM

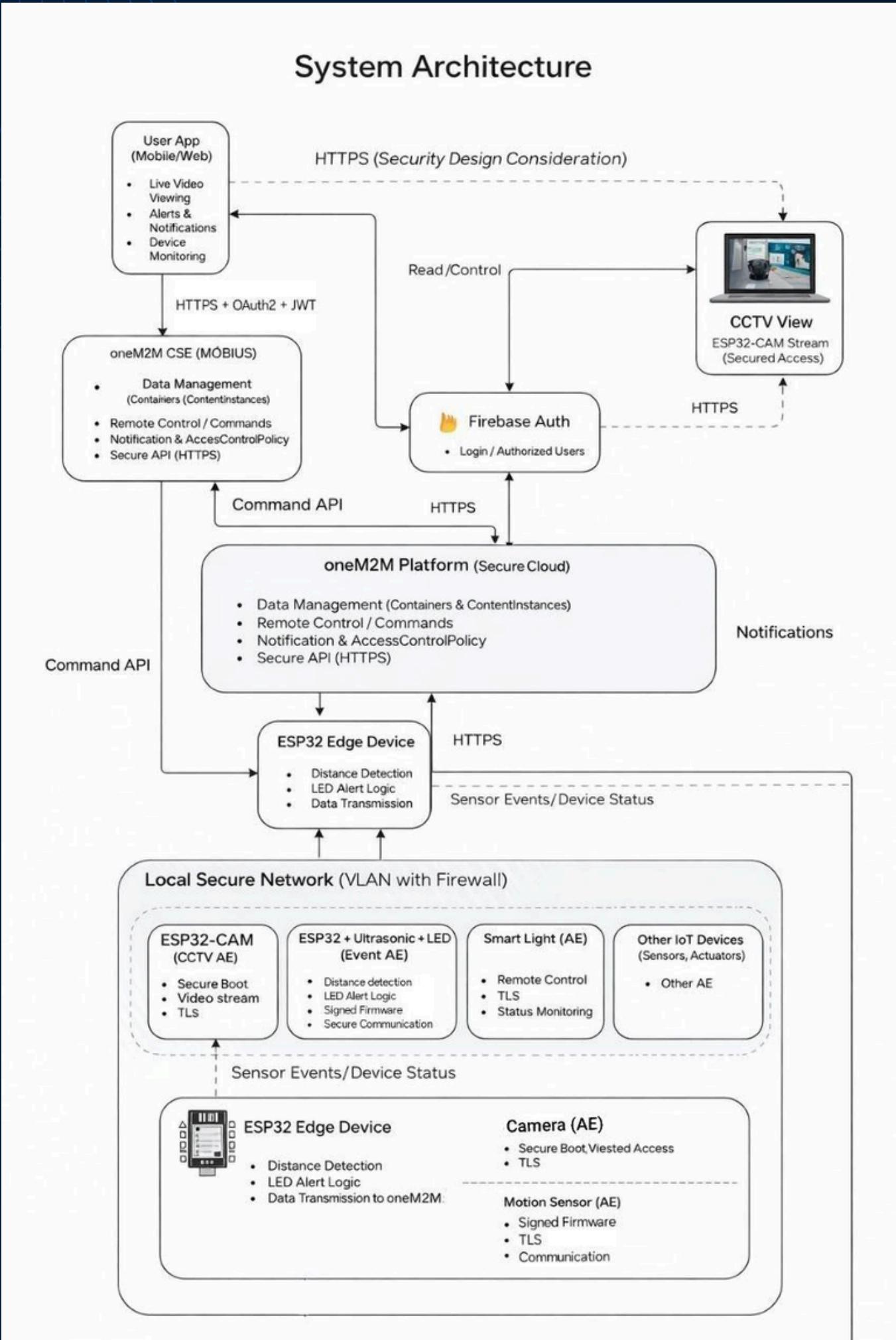


LED

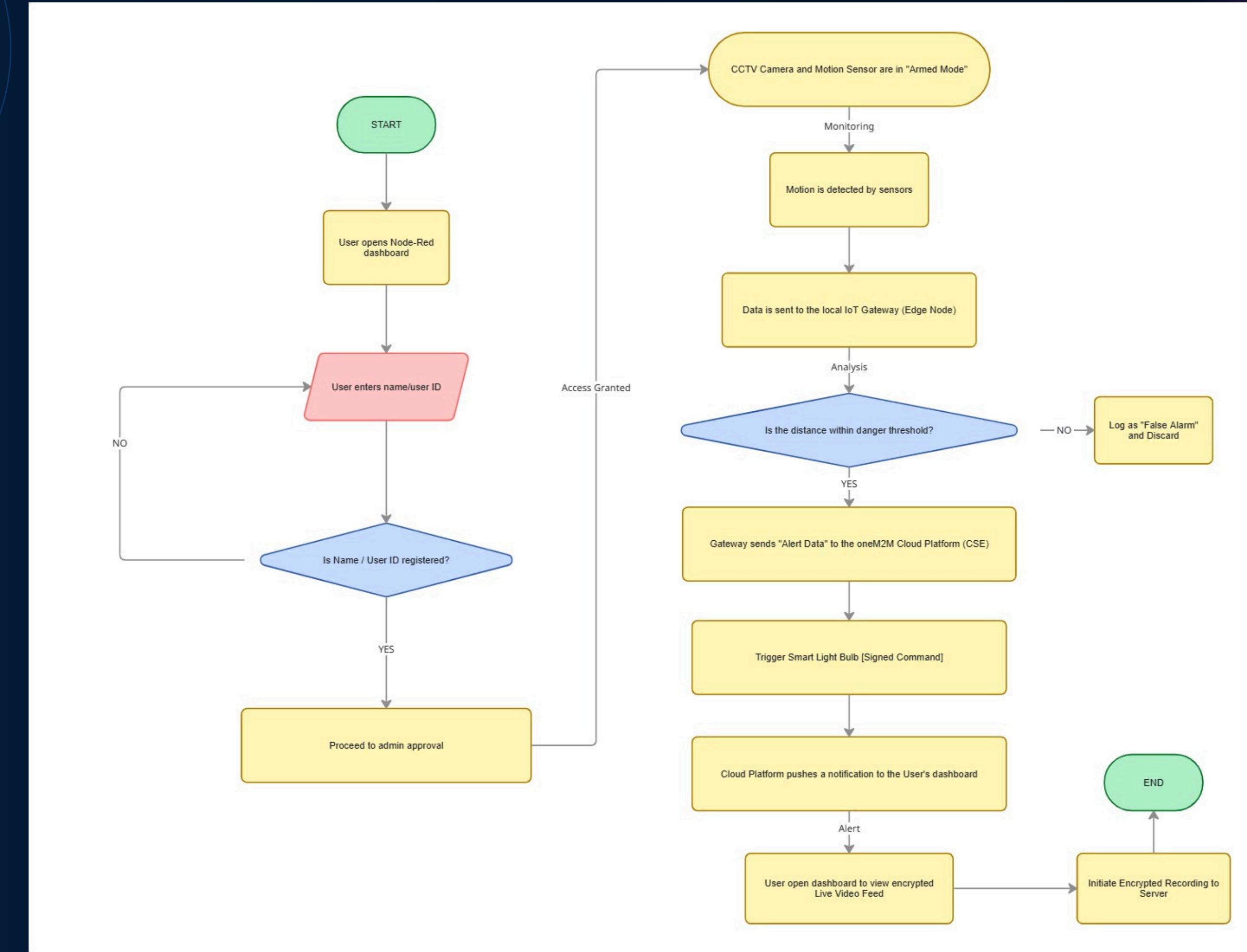


ESP CAM

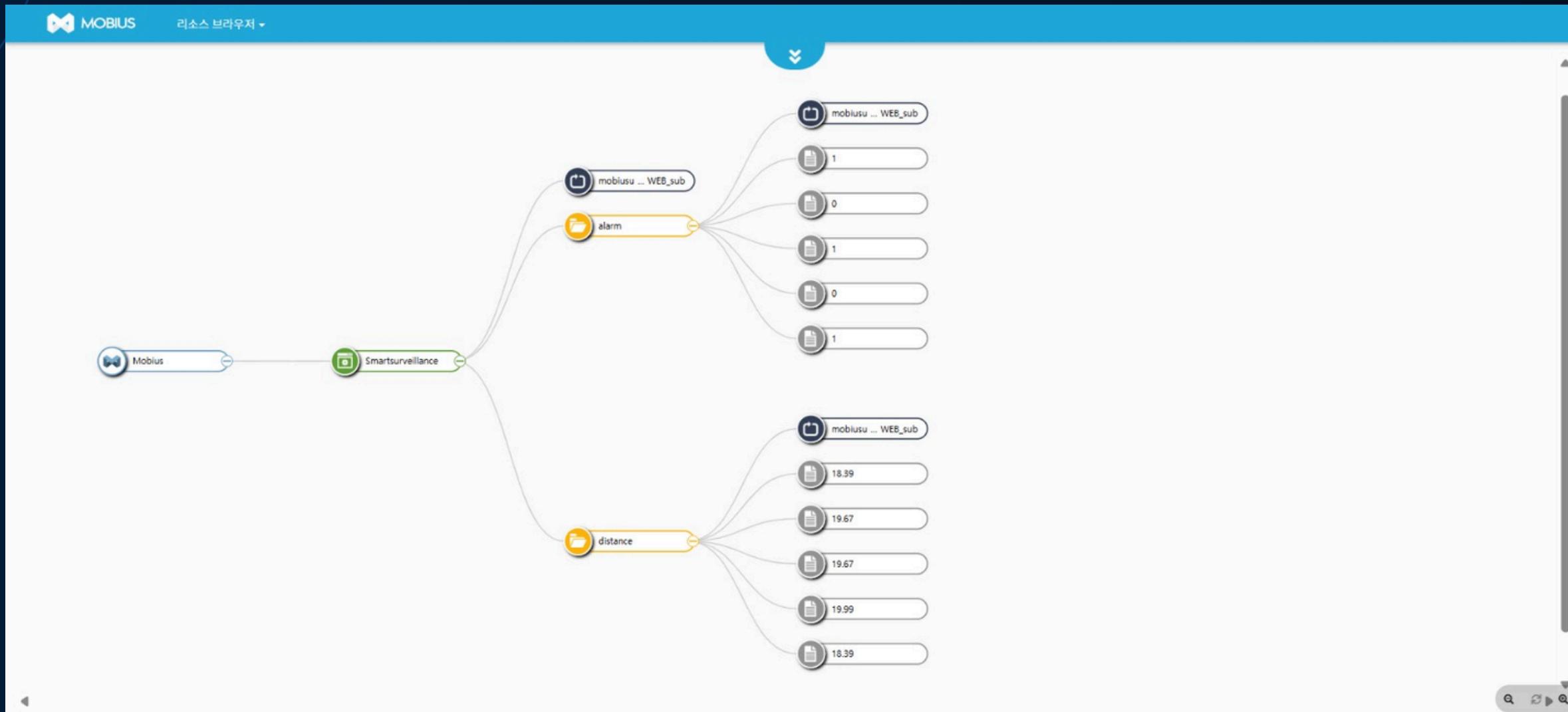
System Architecture



FLOW CHART



OneM2M (Mobius) usage



Usage

- Acts as the **oneM2M Common Services Entity (CSE)**
- Manages IoT data using AE → Containers → ContentInstances
- Central storage for sensor readings and alert status

Example (from system)

- SmartSurveillance (AE)
- distance → ultrasonic readings (cm)
- alarm → alert status (0/1)

Data Management (Postman)

The screenshot shows the Postman interface with a POST request to `http://192.168.56.1:7579/Mobius/Smartsurveillance/distance`. The 'Headers' tab is selected, displaying the following configuration:

Key	Value
X-M2M-Origin	S
X-M2M-RI	12345
Content-Type	application/json;ty=4

Purpose

- Used to test and manage oneM2M REST APIs
- Sebds sensor data to MOBIUS using HTTP POST

The screenshot shows the Postman interface with a POST request to `http://192.168.56.1:7579/Mobius/Smartsurveillance/distance`. The 'Body' tab is selected, showing the raw JSON payload:

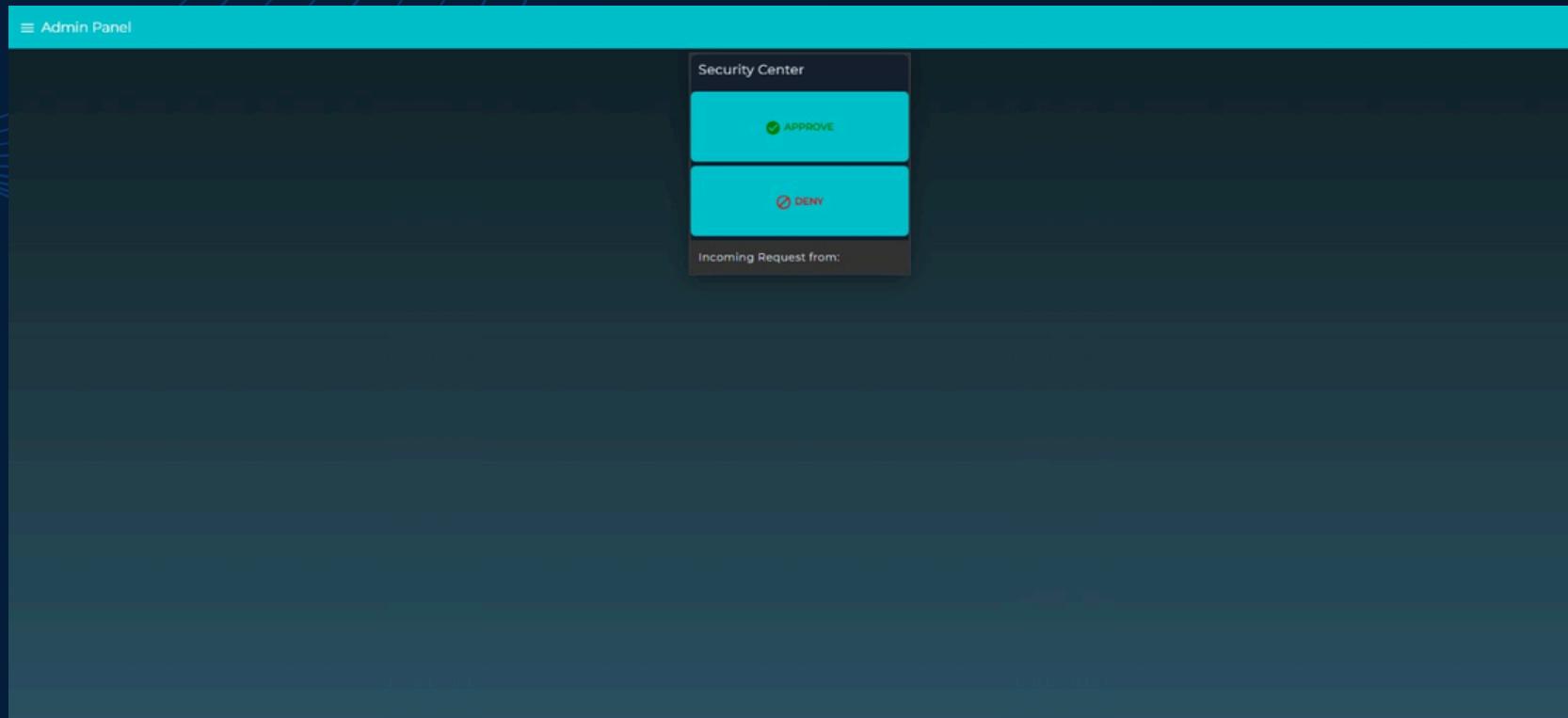
```
1 {  
2   "m2m:cin": {  
3     "con": "75.3"  
4   }  
5 }  
6
```

Sample Request

- URL: POST /Mobius/Smartsurveillance/distance
- json: { "m2m:cin": { "con": "75.3" } }

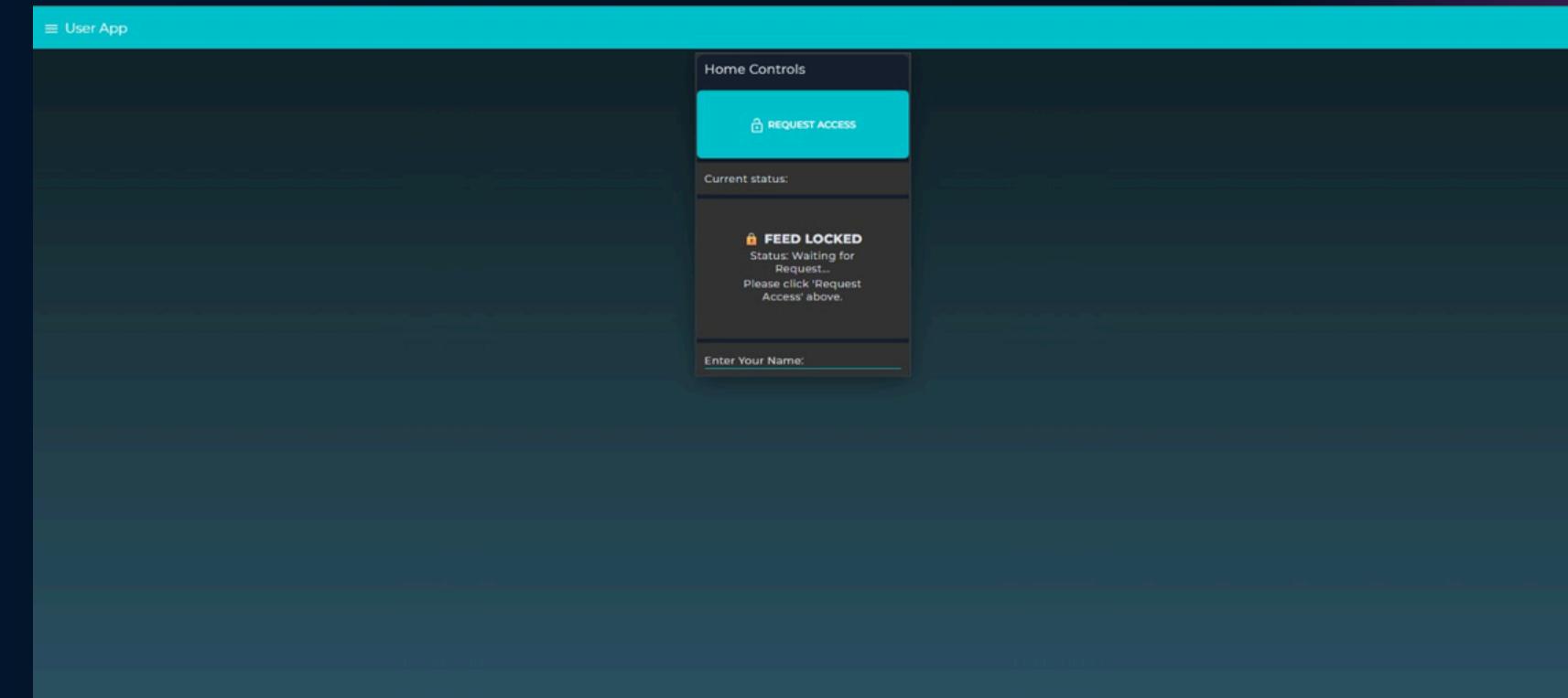
Node-RED dashboard retrieves the latest (/la) from MOBIUS for real-time monitoring

Node-RED Dashboard & Access Control Logic



Admin Panel Features

- Displays incoming access requests
- Admin can approve and deny CCTV access
- Decision immediately updates user dashboard status



User Dashboard Features

- User submits access request by entering name
- Displays current access status (Locked/Waiting/Approval)
- CCTV feed remains locked until admin approval

Node-RED enforces access control before allowing live CCTV viewing

What Security is Implemented?



Authentication & Authorization

Role Based Access Control with distinct role



Secure API & Network Communication

OAuth2 or similar secure token for API endpoints



Privacy Protection

Access limited by user role and permissions



Intrusion Detection & Logging

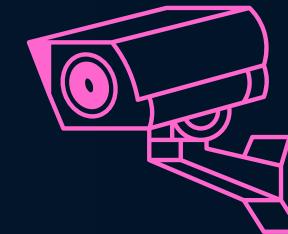
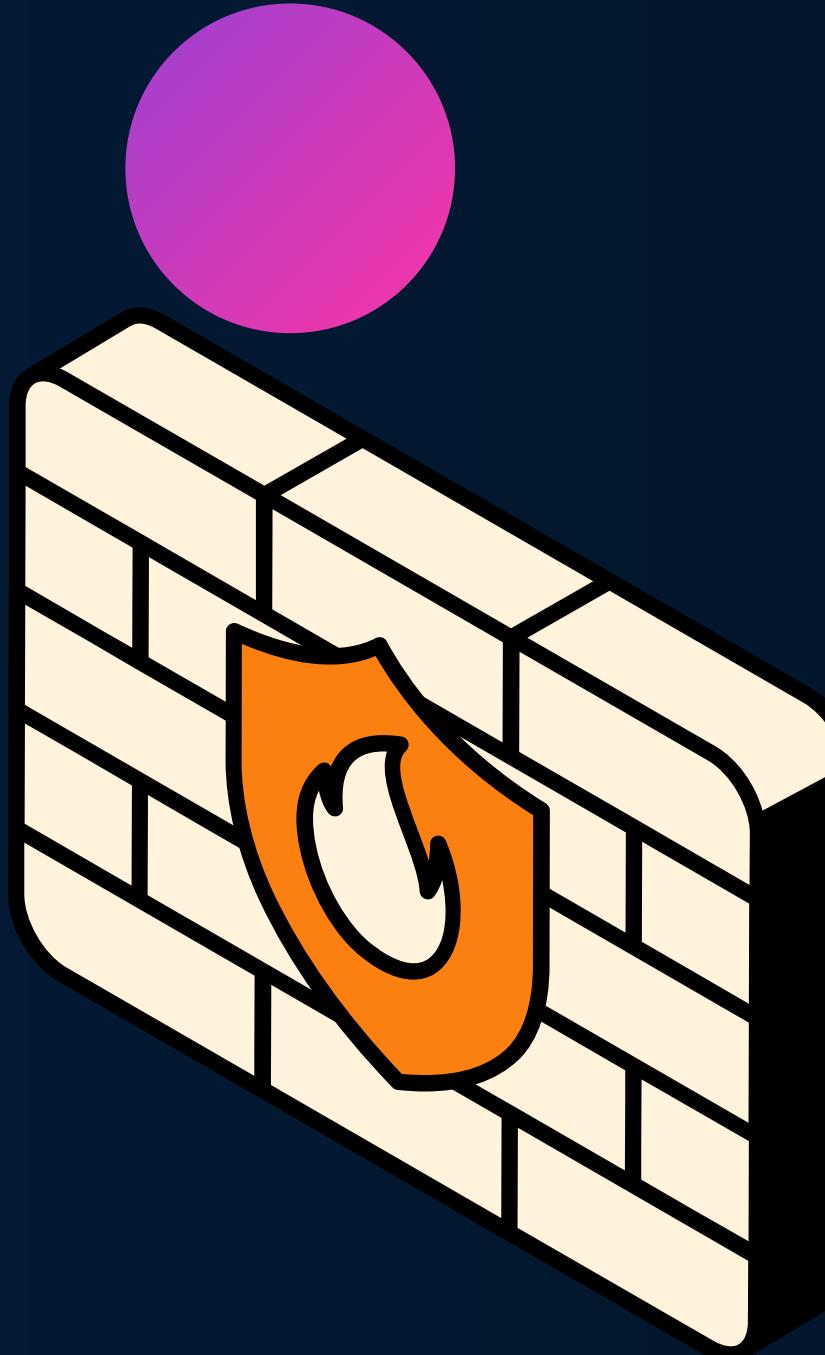
Detect abnormal network activity or unauthorized access attempts



Physical Security

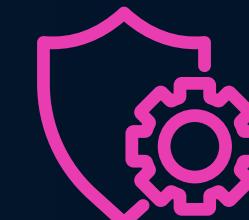
Tamper resistant hardware installed in secured, access controlled location

Threats Overview



Unauthorised CCTV access

An authorized user attempts to view the CCTV feed without permission



False or Accidental Alarm Trigger

Ultrasonic sensor triggers alerts due to noise or normal movement



Data Tempering or Injection

Attackers attempt to modify sensor or alert data in transit

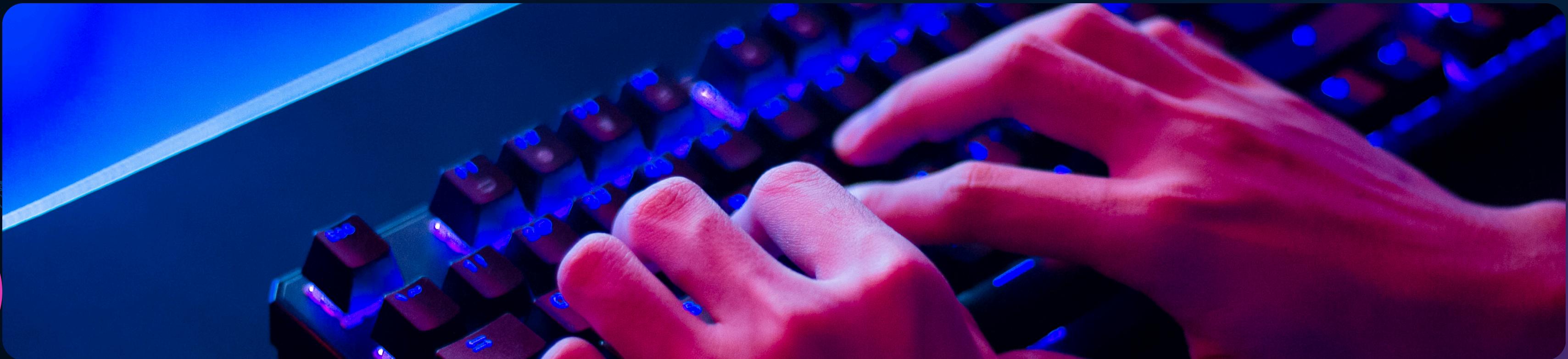


Unauthorized Control of Devices

An attacker tried

Conclusion

- A secure smart surveillance system was successfully implemented using ESP32 devices.
- oneM2M (MÖBIUS) was used for centralized IoT data management.
- Node-RED Dashboard handled access control, admin approval, and monitoring.
- Security was enforced through access control and threshold-based detection.





Thank You!

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