Higher School of Communication of Tunis

Design Document

Smart House Monitoring System

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0.1 Problematic

The primary challenge addressed by this project is the lack of centralized home monitoring and security in many modern homes. Without a dedicated system to oversee utility usage and security, homeowners are often unable to detect unusual events—such as unauthorized intrusions—when away from home, leaving their property and belongings vulnerable.

0.2 Context of the Project

This smart house monitoring system targets homeowners who seek a practical and efficient solution for managing household resources and enhancing home security. It aims to utilize IoT technologies to create a responsive, automated, and user-friendly home environment.

0.3 Architecture

The proposed IoT architecture presents a modern, scalable solution that seamlessly integrates edge computing capabilities with cloud infrastructure. This design emphasizes real-time data processing, robust communication protocols, and intelligent decision-making at both edge and cloud levels.

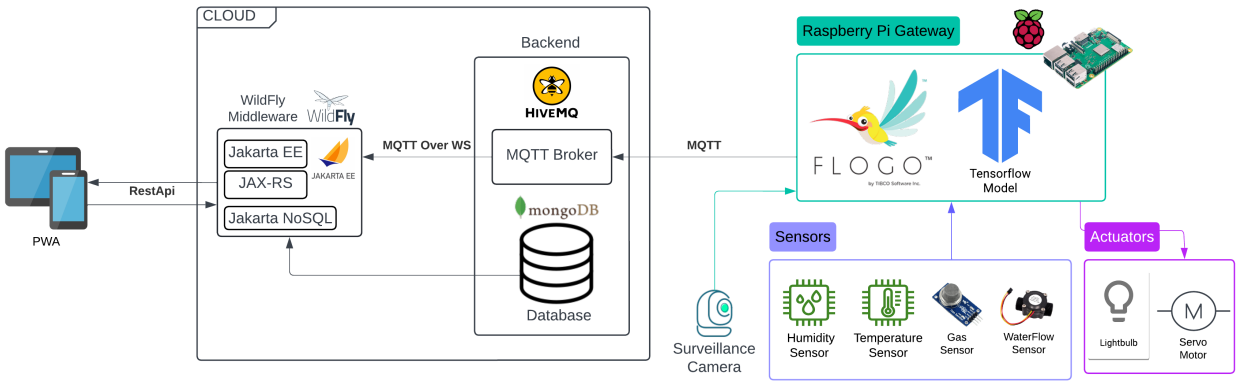

Figure 1: Architecture

1 UML Diagrams

1.1 Use case Diagram

Figure 2 illustrates the Use Case diagram of the system, depicting the primary actors and their interactions with various system functionalities. The system accommodates two main actors: regular users and administrators, each with distinct privileges and responsibilities.

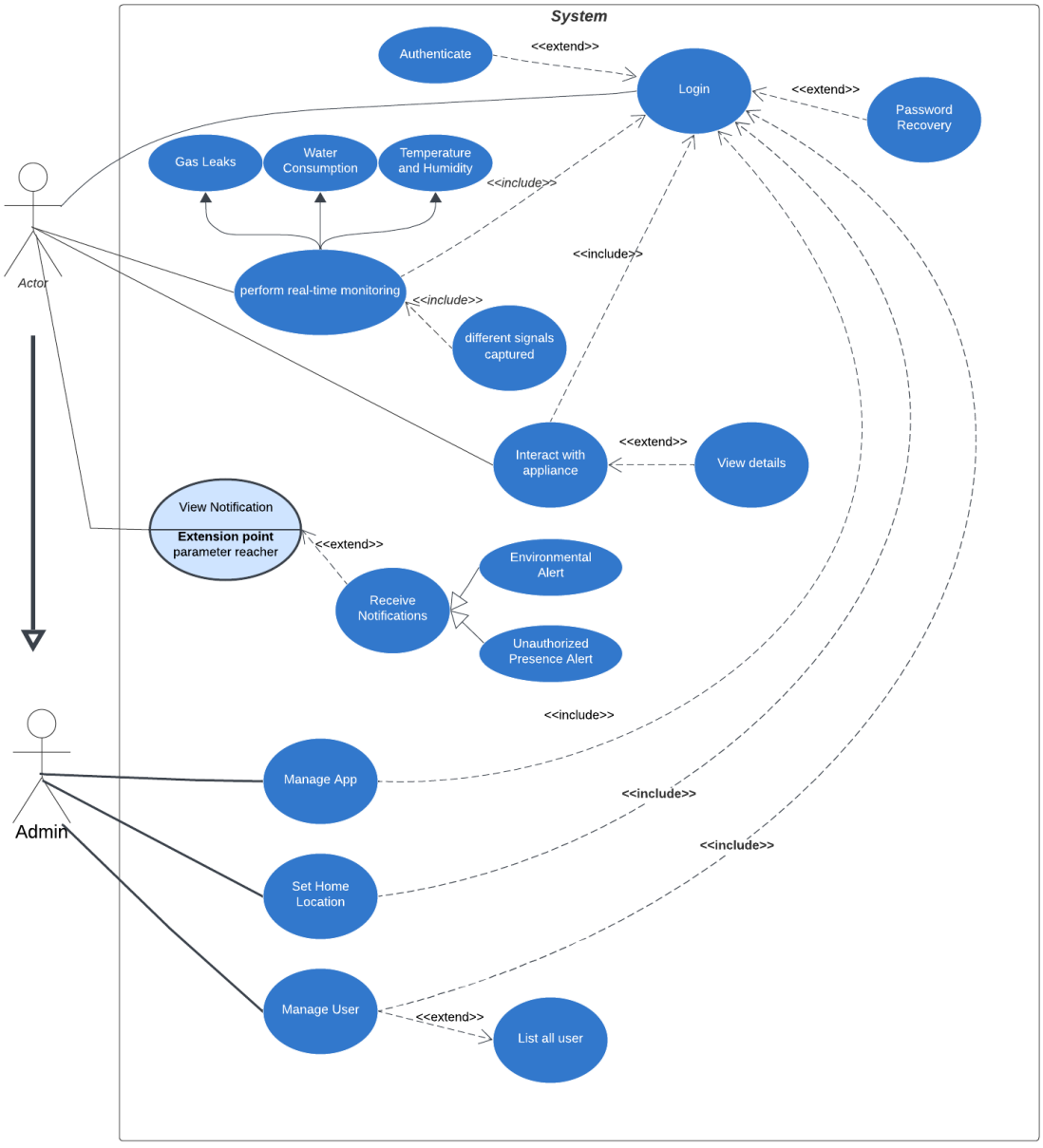

Figure 2: Use case Diagram

1.2 Deployment Diagram

Figure 3 presents the Deployment diagram of the system, illustrating the physical architecture and distribution of software components across different hardware nodes. The system employs a multi-tier architecture leveraging both cloud and edge computing capabilities.

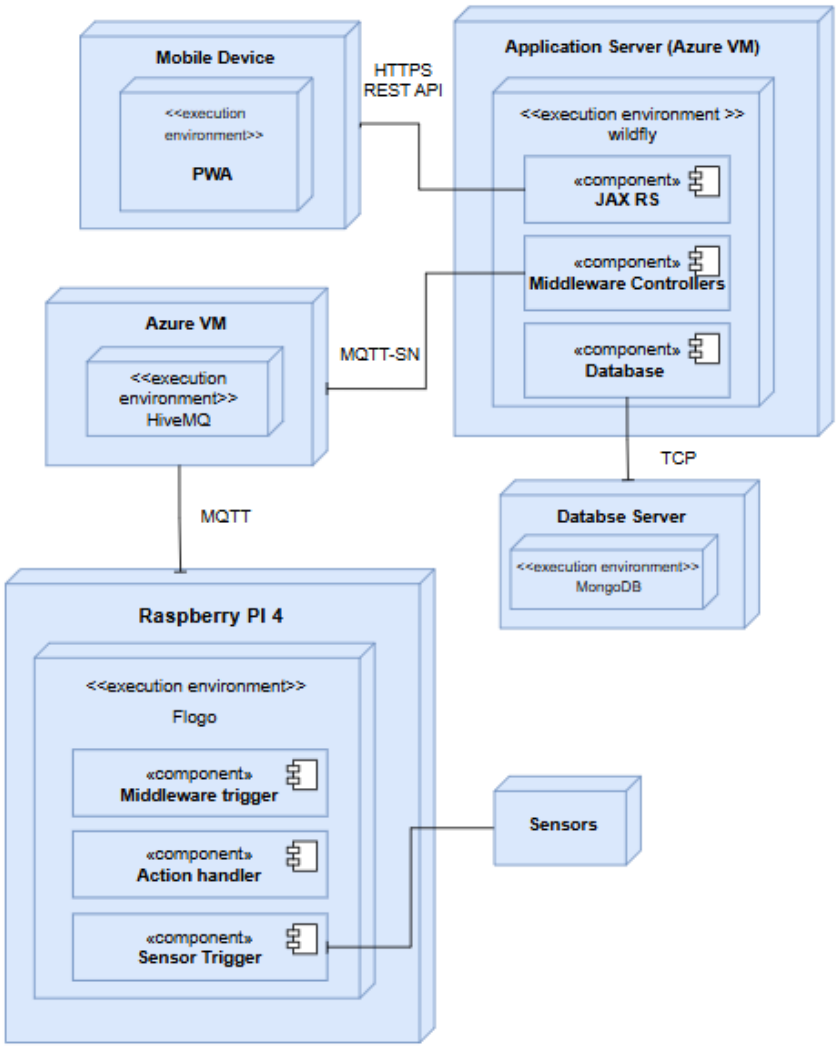

Figure 3: Deployment diagram

1.3 Class Diagram

Figure 4 presents the Class diagram of the system, depicting the object-oriented structure and relationships between various system components. The diagram illustrates the key classes that form the backbone of the smart home monitoring system. At the core, the SmartHome class maintains basic properties like location and status, while managing relationships with Devices and the AlertSystem.

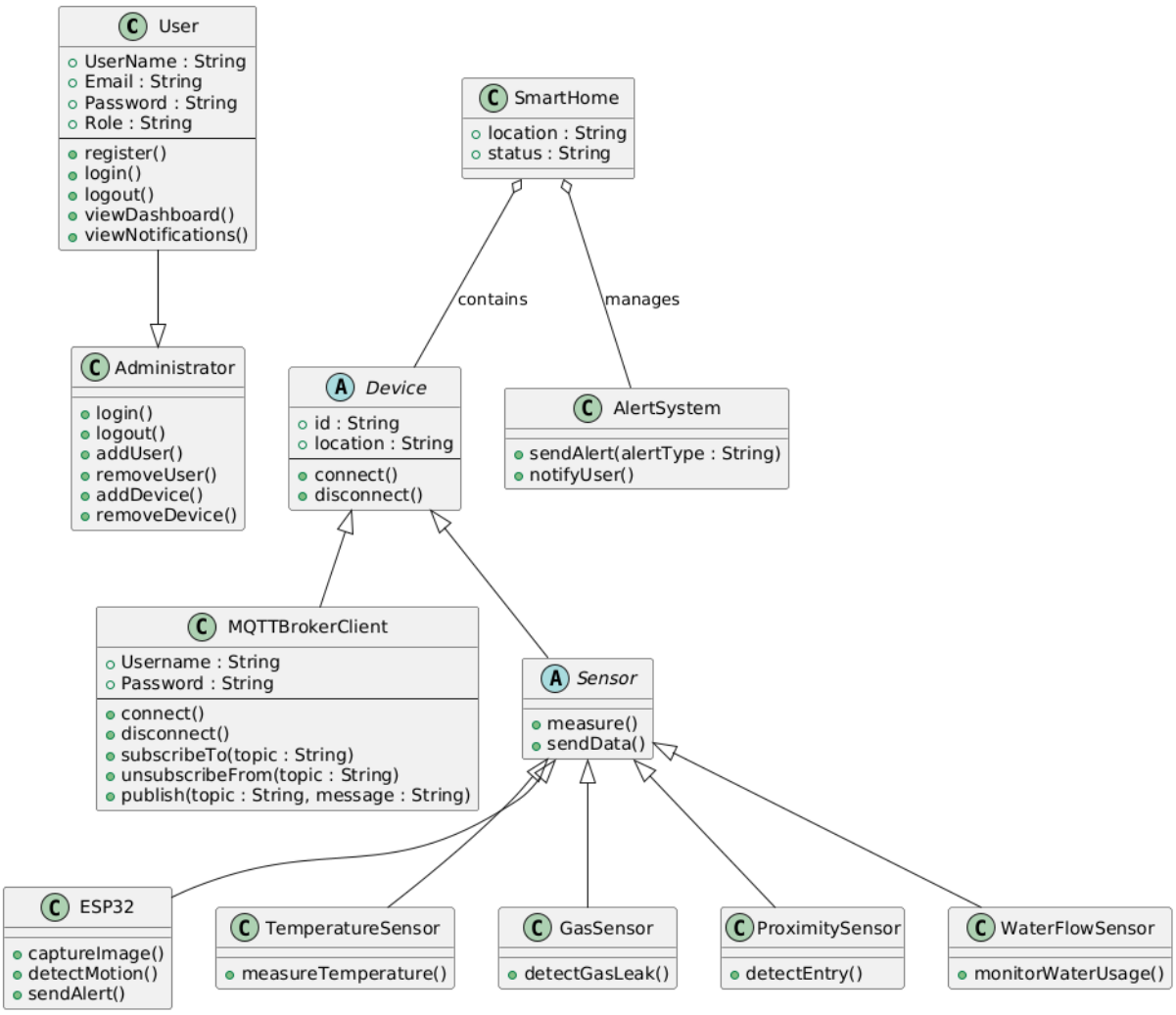

Figure 4: Class diagram

1.4 Sequence Diagram

The sequence diagram in Figure 5 showcases the flow of data and actions between the main components of the system. The Raspberry Pi initiates the data transmission, sending information to the MQTT server through the Flogo application. The MQTT server then checks with the Authorization Server for permissions to publish the data. Depending on the response, the MQTT server either publishes the data to the broker or notifies the system

of an authorization issue. This sequence of actions highlights the secure and conditional communication flow in the smart house monitoring system.

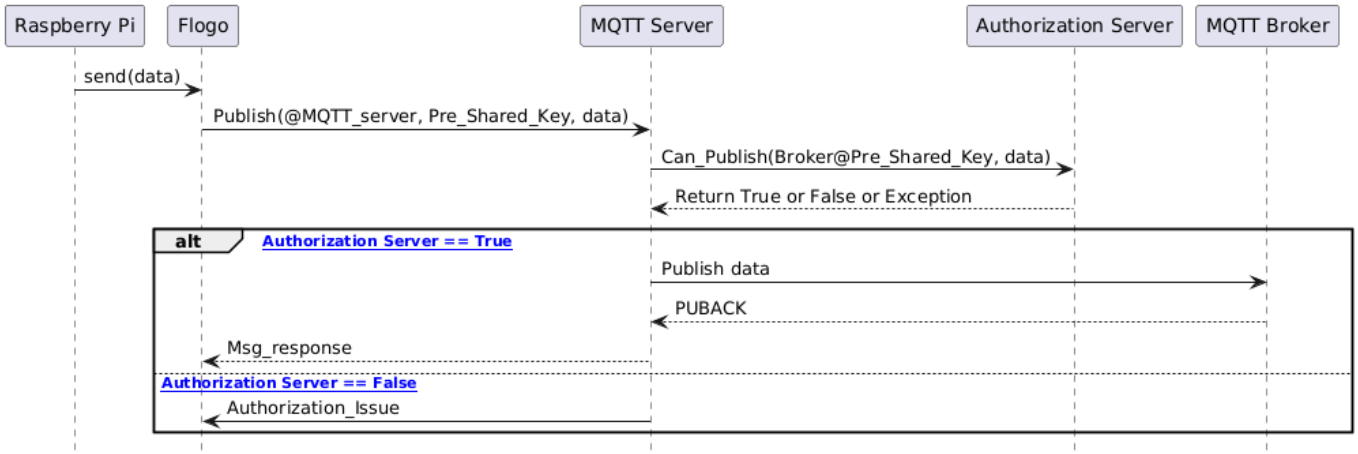

Figure 5: Sequence diagram

Conclusion

In conclusion, the Smart House Monitoring System presents a sophisticated solution for monitoring and managing home resources and security. By leveraging IoT technologies, it ensures that homeowners can monitor essential aspects like utility usage and security alerts in real time. The system's architecture supports scalability and real-time data processing, with robust mechanisms for authorization and secure communication. This project not only demonstrates the technical feasibility of smart home monitoring but also highlights the potential to enhance the safety, efficiency, and convenience of modern homes.