Architecture Decision Record (ADR) - LoRa Network & MQTT Protocol

Decision Summary

Utilize LoRa (Long Range) network technology for wireless communication and MQTT (Message Queuing Telemetry Transport) protocol for IoT messaging in the Fish Watch system.

Context

In the Fish Watch system, there is a need for robust and efficient wireless communication technology to enable data transmission, monitoring, and control in fish farm environments. LoRa technology offers long-range communication capabilities suitable for monitoring and controlling fish farms spread over large areas. Additionally, the MQTT protocol is highlighted as a standard IoT messaging protocol used to facilitate reliable and bidirectional communication between devices and servers in the fish farm system.

Decision Drivers

1. **Long-Range Communication**: The fish farm system spans over large areas, requiring a wireless communication technology with long-range capabilities.

2. **Reliability**: Reliable communication is essential for ensuring seamless data transmission and control operations in the fish farm environment.

3. **Low-Power Consumption**: Low-power communication technology is preferred to conserve energy and extend the battery life of devices deployed in the fish farm.

4. **Efficiency**: Efficient messaging protocol is needed to enable real-time data exchange and device coordination in the fish farm system.

Considered Options

1. **LoRa Network and MQTT Protocol**: Utilize LoRa technology for wireless communication and MQTT protocol for IoT messaging.

2. **Alternative Wireless Communication Technologies**: Explore other wireless communication technologies such as Wi-Fi or cellular networks.

3. **Different Messaging Protocols**: Consider alternative messaging protocols for IoT communication, such as CoAP (Constrained Application Protocol) or AMQP (Advanced Message Queuing Protocol).

Decision Outcome

We choose to utilize LoRa (Long Range) network technology for wireless communication and MQTT (Message Queuing Telemetry Transport) protocol for IoT messaging in the Fish Watch system.

Pros and Cons of the Selected Option

Pros

- **Long-Range Communication**: LoRa technology enables communication over long distances, suitable for fish farm environments spread over large areas.

- **Reliability**: MQTT protocol ensures guaranteed message delivery, even in unreliable network conditions, ensuring reliable communication between devices and servers.

- **Low-Power Consumption**: Both LoRa and MQTT are designed for low-power consumption, helping to extend the battery life of devices deployed in the fish farm.

- **Efficiency**: MQTT protocol facilitates efficient messaging and data exchange, enhancing the overall efficiency of the fish farm system.

Cons

- **Initial Implementation Complexity**: Implementing LoRa network and MQTT protocol may require initial setup and configuration, adding complexity to the system architecture.

Risks and Mitigations

- **Interference**: Mitigate the risk of interference with other wireless communication systems by selecting appropriate LoRa frequency bands and optimizing network deployment.

- **Security**: Implement robust security measures, such as encryption and authentication, to protect data transmitted over the LoRa network and MQTT protocol.

Consequences

The decision to utilize LoRa network technology and MQTT protocol in the Fish Watch system ensures robust and efficient communication networks for data transmission, monitoring, and control in fish farm environments. This approach aligns with the requirements for long-range communication, reliability, low-power consumption, and efficiency in the fish farm system architecture.