Software Engineering for the Internet Of Things

Title: Elderly Patient Monitoring System

Group ID: 09

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1. Project Objectives

The primary objective is to develop a reliable, efficient, and user-friendly monitoring system that can track key health metrics of elderly patients and alert caregivers and healthcare professionals in case of any abnormality or emergency.

2. Features

a. **Reliable Monitoring**: To provide continuous and reliable monitoring of vital health metrics for elderly patients.
   i. **Heart Rate (Pulse)**: This is a fundamental indicator of cardiovascular health. Abnormal heart rates can signal various conditions, from heart rhythm disorders to the effects of medications.
   ii. **Temperature**: Critical for detecting fever or hypothermia, which can be crucial indicators of health issues in elderly patients.
   iii. **Fall Detection/Mobility Monitoring**: For elderly individuals, falls are a major risk and can lead to serious injuries. Monitoring mobility and detecting falls can help in providing immediate assistance and in preventing future incidents.

b. **Alert Mechanism**: Instant notification to caregivers and healthcare professionals in case of emergencies or abnormalities.

c. **Data Analysis**: To enable historical data analysis for informed healthcare decisions.

3. System Architecture

a) **Sensor Network**: We will use a range of sensors to measure health metrics like heart rate, blood pressure, oxygen saturation, and fall detection.

b) **Data Transmission**: Sensors will send data using MQTT, ensuring reliable and efficient communication.

c) **Data Aggregation and Processing**: Node-RED will collect and process the data before storage.

d) **Data Storage**: InfluxDB will store the time-series data, allowing for efficient data retrieval and historical analysis.

e) **Data Visualization and Alerts**: Grafana will be used to visualize the data in real-time and trigger alerts based on predefined thresholds.

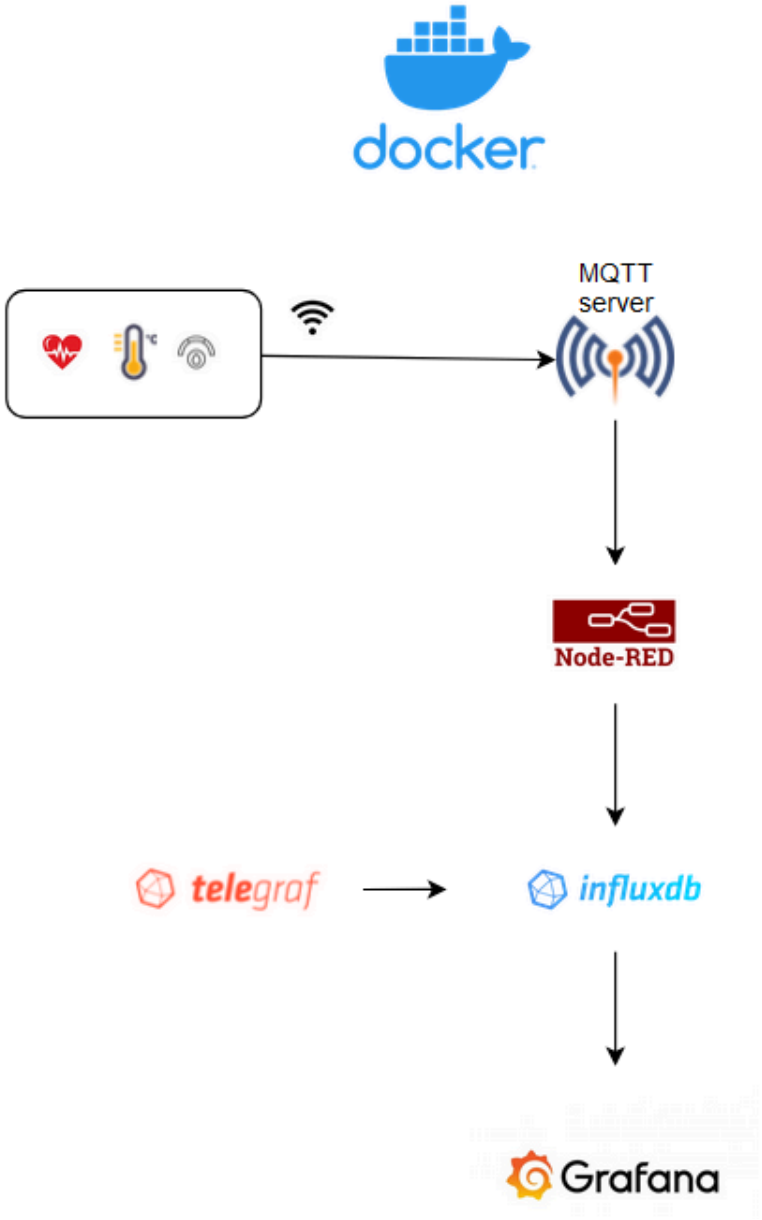

Figure: Software architecture

4. Technology Stack

a. **MQTT (Message Queuing Telemetry Transport):** This lightweight messaging protocol is ideal for the low-bandwidth, high-latency environments. So, it's seemingly suitable for our remote elderly patient monitoring scenarios. Its publish-subscribe model is well-suited for transmitting sensor data efficiently.

b. **Node-RED:** Processes incoming data, applies logic (e.g., threshold checks for alerts), and manages data flow into the database and visualization tools.

c. **InfluxDB:** A time-series database optimized for high-write loads and real-time analytics, perfect for storing sensor data.

d. **Grafana:** For creating interactive visualizations and dashboards from the data stored in InfluxDB.
e. **Docker**: Containerizing each component for modularity and ease of deployment.

5. Conclusion

This Elderly Patient Monitoring System promises to enhance the care and safety of elderly patients through advanced technology. By utilizing MQTT, Node-RED, Docker, InfluxDB, Grafana, this system ensures comprehensive monitoring with real-time data processing and visualization, contributing significantly to the well-being of elderly patients.