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Research Article

Improving efficiency and reliability in the seismic monitoring systems based on the Internet of Things by applying redundancy in sensors and controllers

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Abstract

Earthquakes are usually associated with damages. Therefore, any action to predict it is necessary. In data monitoring systems, being real-time and accuracy of data play a key role. In this article, a monitoring system based on Internet of Things was proposed for the messaging of seismic data. In the first solution, the lightweight protocol Message Queuing Telemetry Transfer (MQTT) was chosen for messaging. In the second solution, redundancy was applied in the sensor layer using the gray wolf algorithm, and in the third solution ،redundancy was applied in the controller layer. The simulation results showed that the redundancy in the sensor and controller layer saved energy consumption by more than thirty percent. Also, the average end-to-end delay was significantly reduced in the second and third solutions. Finally ،in the first solution, the rate of successful package delivery for different number of packages was a constant value of 78.98%. But by applying redundancy in the sensor and controller, the package delivery rate increased to over 92%, which can be the result of increasing the number of sensors and controllers and their proper placement.

Keywords: Seismic, Internet of Things, Energy Consumption, Packet Delivery Rate, Bit Error.

Highlights

- Improving the efficiency of the seismic monitoring system by applying the redundancy of the sensors of the sensors layer based on the Internet of Things.
- Applying redundancy in the controller layer of seismography system based on Internet of Things.
- Improving fault tolerance in the communication layer of the Internet of Things by modifying the information transmission mechanisms from the controller to the infrastructure layer.

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