IoT Implementation For Optimal Condition Logistics

Ashwin Goyal, 01711502818   Bhavesh Prasad Dangwal, 01811502818

Deepanshu Tyagi, 02011502818   Gautam Manocha, 02611502818

Department of Electronics & Communication Engineering
Bharati Vidyapeeth's College Of Engineering
29th September 2021

1   Introduction

The pandemic revealed many shortcomings of the current healthcare system in many countries. It also introduced many new problems that the existing system found difficult to accommodate and tackle. One such issue was effective monitoring of vaccines during transportation. This is especially important when vaccines need to be transported all throughout the nation and even internationally, safely. In this project we aim to address some of these issues by creating a system for chain logistics for monitored transportation of important products such as vaccines.

2   Literature Survey

- Cold Chain Logistics (CCL) management, in general, is the management of necessary refrigeration level for temperature sensitive product.[1]

- In [2], analysis of cold chain logistics using ISM has been investigated. India, currently, has very limited development in such logistic systems.

- In [3-6] application of wireless sensor network and Internet of Things(IoT) in CCL have been investigated.

- In [7], a system called SensIC for monitoring the refrigerated storage of drugs and vaccines was proposed offering alarm tools in case of malfunction of system.

- In [8-9], cold chain logistics system was developed to study the effects of temperature using IoT and blockchain, monitoring the temperature continuously.

3   Research Gap

Following are the certain limitations of the current state of monitoring systems:

- Cold chain logistics is limited in countries such as India.

- Only temperature is considered in the monitoring systems. Other factors that affect the product are neglected

- Data security, especially in case of important products such as medical drugs and vaccines, is a huge concern

4   Objectives

Following are the objectives of our project:

- Create an IoT enabled monitoring device/container for vaccine vials.

- Record the sensor data collected via the IoT network.

- Create a logistics system for quality control.

- Create an alert system in case of an emergency(Vaccine under non optimum conditions).

5   Methodology

The System Comprises of:

- Data Collection modules that consists of a mini compute unit (raspberry pi) that is connected to internet via WIFI and collects the data from the following sensors:

  - DHT 11 - Temprature and Humidity Sensor
  - BMP180 - Air Pressure Sensor
  - BH1750 - UV Light sensor

- 4 data collection and transmitting modules that share the vaccine vital stats

- An elasticsearch database that stores and indexes all the data from the modules

- Fronted Kibana Dashboard monitor that allow the user to gauge the vaccines stats

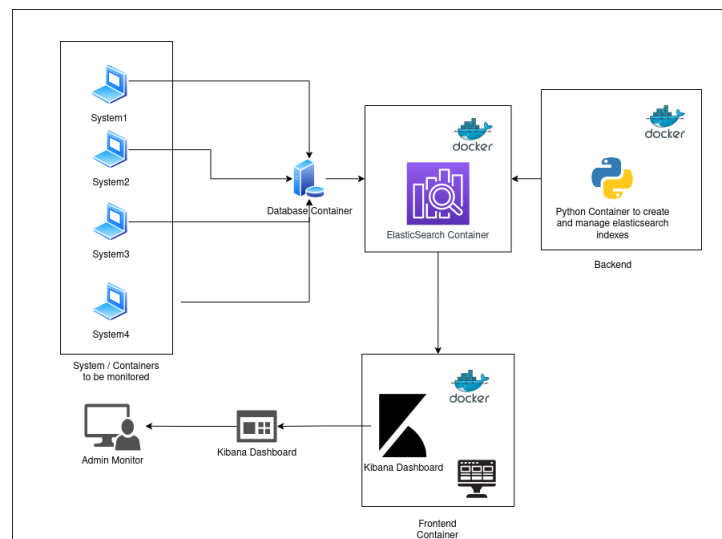- Python client for elastic search database to push data to elasticdatabase

Figure 1: Mehtodology

References

[1] C.-W. Shih and C.-H. Wang, "Integrating wireless sensor networks with statistical quality control to develop a cold chain system in food industries," *Computer Standards & Interfaces*, vol. 45, 2016. DOI: `10.1016/j.csi.2015.12.004`.

[2] S. Monteleone, M. Sampaio and R. F. Maia, "A novel deployment of smart cold chain system using 2g-rfid-sys temperature monitoring in medicine cold chain based on internet of things," *2017 IEEE International Conference on Service Operations and Logistics, and Informatics (SOLI)*, 2017. DOI: `10.1109/soli.2017.8120995`.

[3] J. Ruan and Y. Shi, "Monitoring and assessing fruit freshness in iot-based e-commerce delivery using scenario analysis and interval number approaches," *Information Sciences*, vol. 373, pp. 557–570, 2016. DOI: `10.1016/j.ins.2016.07.014`.

[4] A. A. Chandra and S. R. Lee, "A method of wsn and sensor cloud system to monitor cold chain logistics as part of the iot technology," *International Journal of Multimedia and Ubiquitous Engineering*, vol. 9, no. 10, pp. 145–152, 2014. DOI: `10.14257/ijmue.2014.9.10.15`.

[5] D. Zhang and T. Han, "Analysis of risk control factors of medical cold chain logistics based on ism model," in *2020 Chinese Control And Decision Conference (CCDC)*, IEEE, 2020, pp. 4222–4227.

[6] Y. Xv, X. Zhang, X. Qiu and X. Liang, "Analysis of cold chain development based on ism model under the situation of (covid-19)," in *2020 16th Dahe Fortune China Forum and Chinese High-educational Management Annual Academic Conference (DFHMC)*, IEEE, 2020, pp. 254–257.

[7] A. H. A. Halim, M. H. A. Halim, S. Usman *et al.*, "Implementation of iot and blockchain for temperature monitoring in covid19 vaccine cold chain logistics," *Open International Journal of Informatics*, vol. 9, no. 1, pp. 78–87, 2021.

[8] J. Ruan and Y. Shi, "Monitoring and assessing fruit freshness in iot-based e-commerce delivery using scenario analysis and interval number approaches," *Information Sciences*, vol. 373, pp. 557–570, 2016.

[9] L. Ding, J. Wang and L. Li, "Privacy-preserving temperature query protocol in cold-chain logistics," in *2015 7th International Conference on Intelligent Human-Machine Systems and Cybernetics*, IEEE, vol. 1, 2015, pp. 113–116.

[10] S. Shingh, V. Kamalvanshi, S. Ghimire and S. Basyal, "Dairy supply chain system based on blockchain technology," *Asian Journal of Economics, Business and Accounting*, pp. 13–19, 2020.

[11] T. Bengiovanni, R. C. Rosito, V. Lacasa, E. Simone, I. Sergi, V. Iacovone, M. Viggiano and L. Patrono, "Risk management and healthcare: Iot technologies and smart monitoring system for a good cold chain management," in *2020 5th International Conference on Smart and Sustainable Technologies (SpliTech)*, IEEE, 2020, pp. 1–6.