Design of Industrial Waste Monitoring System using Splunk (IWMS)

M. Yauvana Roja
Dept. of CSE
Periyar Maniammai Univ.
Thanjavur, INDIA

R. Pragdeashwar
Dept. of CSE
Periyar Maniammai Univ.
Thanjavur, INDIA

P. Sunil Kumar
Dept. of CSE
Periyar Maniammai Univ.
Thanjavur, INDIA

Abstract - **Industries play a vital role in building the economy of a country. Industries are crucial such that it either directly or indirectly have impact on the GDP of a country. It is a unique sector which is renowned for its strategic importance for both the citizens and economic growth of our country. The main objective of this proposed method is to design and develop an Industrial Waste Monitoring System [IWMS] using Splunk to minimize the air pollution [Asian Brown Cloud]. The pollutants emitted from the Industry contributes to vast extent in concerned with Asian brown Cloud. Various pollutants from the industries like CO, Sulphur –di –oxide, Ozone and other hazardous substance. Air pollution, Water Pollution and soil pollution are often caused directly due to inefficiency in disposal of waste. The main objective of this proposed paper is to design and develop an industrial waste monitoring system using Splunk to enhance the quality of air or smoke emitted from an industry without any manual observance. This system periodically measures the amount of pollutants emitted from the industry. The industrialists and the people from emission control are notified about pollutants rate emitted from a factory. This system helps the emission control board in inspecting the emission from industries. As a consequence, it reduces the ill effects caused by pollutants emitted from a factory/ industry thus laying path for a healthy/ better ecosystem for our citizens.**

Keywords – Industry, Splunk, environmental variables, monitoring server, Asian Brown Cloud, emission and data acquisition

1. INTRODUCTION

Industrialization is vital for building our Indian Economy. It is an unmistakable part which is conspicuous for its significance for the natives and the financial advancement of our nation. The proposed extend goes for building up an Industrial waste observing framework utilizing splunk to diminish the ecological corruption brought on by radiating or letting the waste source from ventures into the biological community without treating it. Enterprises offer a few advantages to our nation viz. shifted business openings, higher national wage, better usage of characteristic assets, fabricating equipped merchandise and items. Different toxins from the ventures like CO, Sulfur –di –oxide, Ozone and different unsafe substance. Air contamination, Water contamination and soil contamination are regularly brought on straightforwardly because of wastefulness in transfer of waste. Long haul presentation to contaminated air and water causes incessant medical issues, making the issue of modern contamination into an extreme one. It likewise brings down the air quality in encompassing territories which causes numerous respiratory issue. Splunk is the major tool which is being utilized as a part of our framework.

II. LITERATURE SURVEY

Implementation of low cost sensor nodes as of late permit sensor hubs to be pertinent in a wide range of regions e.g. environment monitoring, homeland security and disaster relief operations. One major contribution is their high demand on data acquisition [1]. Real-time data acquisition is more challenging and promising issue in these application areas. Splunk is a dominant Big Data tool which is capable of processing real-time data at the speed of Penta-byte of data per Second. It is capable of handing out Structured as well as Unstructured data in a proficient manner. Details about Splunk are given below:

A. Splunk

Splunk is a big data tool used to analyse and monitor real time data coming in a large amount and actions can be taken on real time to avoid catastrophe. It is used to collect the data from any kind of sources where pre-processing of data is done and then stored in real time, This data can be then used for search and analysis. After the Analysis part data is represented in a simple manner which can be understood even by a School grad or uneducated people. History of Data Analysis allows generating statistics which can be helpful to forecast any kind of crisis.

B. Forwarder

Forwarder is a splunk component used to forward the data from source to a Data centre or any destination. It requires minimum system requirement. Any kind of data formats can be forwarded. Multiple remote system or data sources can be monitored real-time and the data can be

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forwarded. There are two types of Forwarder component in splunk they are Universal Forwarder and Heavy Forwarder.

C. Universal Forwarder

Universal Forwarder is a light weight component of splunk. It is used only to forward the data. Data from any kind of sources are forwarded by this component. In the Application Server, this Splunk light weight component is installed and when the component is started it starts to forward the data. It forwards the data to the Heavy Forwarder or Indexer. It sends data in a secure, reliable manner to Splunk Enterprise instances. By default, it sends the data by 9997 port using TCP protocol. Default data transfer rate is 256 kbps.

D. Heavy Forwarder

It is a heavy weight instance of splunk. It can Forward as well as perform some special abilities on data. Heavy Forwarder can also be directly installed on Application server so that it can also parse as well as forward the data to the splunk component, It is advised not to carry on this process since it consumes large amount of RAM so that the system may crash or slow down the process. Heavy Forwarder can parse the data before it is forwarding to the Indexer. Load balancing, Parsing, Processing by REGEx can also be done by Heavy Forwarder. Component requires 12GB of RAM minimum.

E. Load Balancer

Load balancer is a splunk component used for balancing the Data load coming from the Source. It separates the data in an equal amount and forwards to the Heavy forwarder or Indexer. It also saves the system from crashing due to heavy traffic or any loss of data.

F. Indexer

Indexer is a Splunk heavy weight component used for storage purpose. It also enables search head usage but most often it is used for storage purpose only because of efficient management of data. It provides storage purpose for local and remote data. It stores the Data in the form of events which will be helpful for searching purpose enabled by the Search Head.

G. Splunk Search Head

A search head is a Splunk instance which enables distributed searches to Indexer or search peers. This search head can generate results from remote indexers using Splunk Processing Language. Search Head is both CPU and Memory intensive. In search Head, we can generate results, dashboard, graphs. etc.

H. Deployment Server

Deployment server is used for managing the configurations of splunk components. It works on a Push mechanism. If there is any configuration change in terms of any of the splunk components Deployment server comes in to action. Deployment Server pushes the configurations to the Deployment clients where the configurations is need to be changed.[6]

III. EXISTING METHOD

The existing system consists of a design to read and monitor pollution parameters and if any of these factors exceeds the industry standards, immediately this information send to pollution control authority by using GSM [2]. It is proven that the implementation cost is too expensive that it can be employed in real time for medium and small scale industries. The existing system might fail completely in case of network error, as it uses the GSM module. The existing system doesn't have any provision for the pollution control board for monitoring the smoke (especially carcinogenic agents) emitted from industries of their respective region [3][4][5].

IV. PROPOSED METHOD

The proposed system deals with the usage of Splunk as the major tool for analyzing the data generated from the sensors. The sensor association is based on wireless sensor networks[WSN]. The sensors are fixed at the emission pose. The sensor nodes do not converse with each other rather it exchanges data with the gateway (Heavy Forwarder, Universal Forwarder and Load Balancer). The physical log file is sent as data packets via gateway to the Indexer. The log files are stored to the Indexer here the data are stored after clustering from various source. When the client queries the server, the splunk admin process the query through splunk search head and then respond accordingly. This prototype examines a range of physical values obtained from the sensors of any particular stance, processes it and intimates the industrialists and people of emission control regarding the pollutant emitted from the factory for each and every phase of production. Monitoring interface included the real-time display parameters such as selected node, current temperature tested by selected node, relative humidity, moisture, smoke concentration and so on [2].
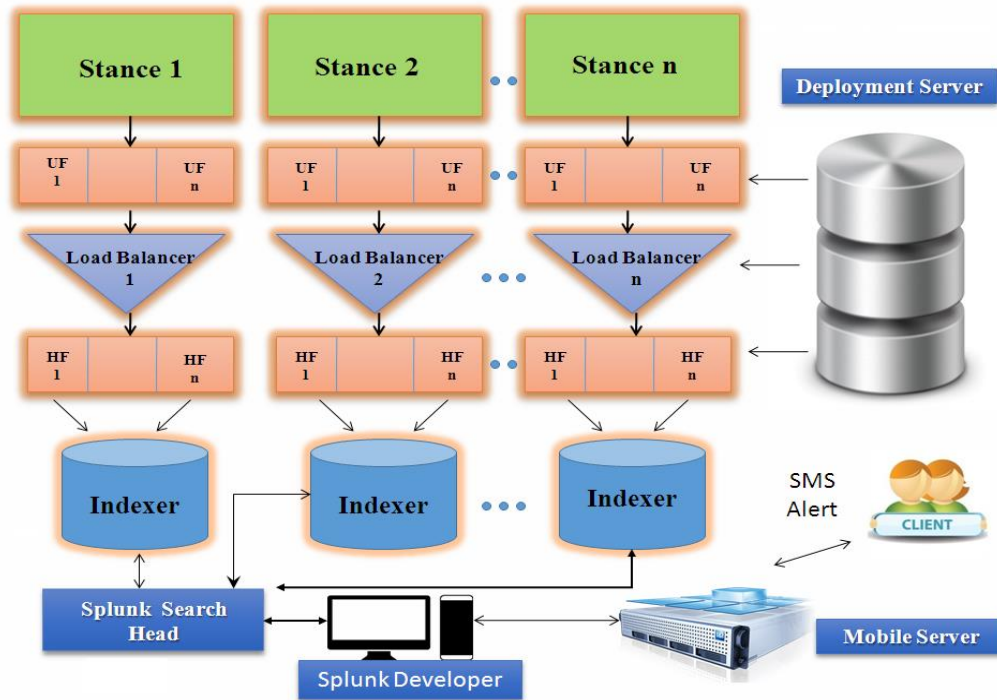
Fig. 1. IWMS Architecture [For a zone]
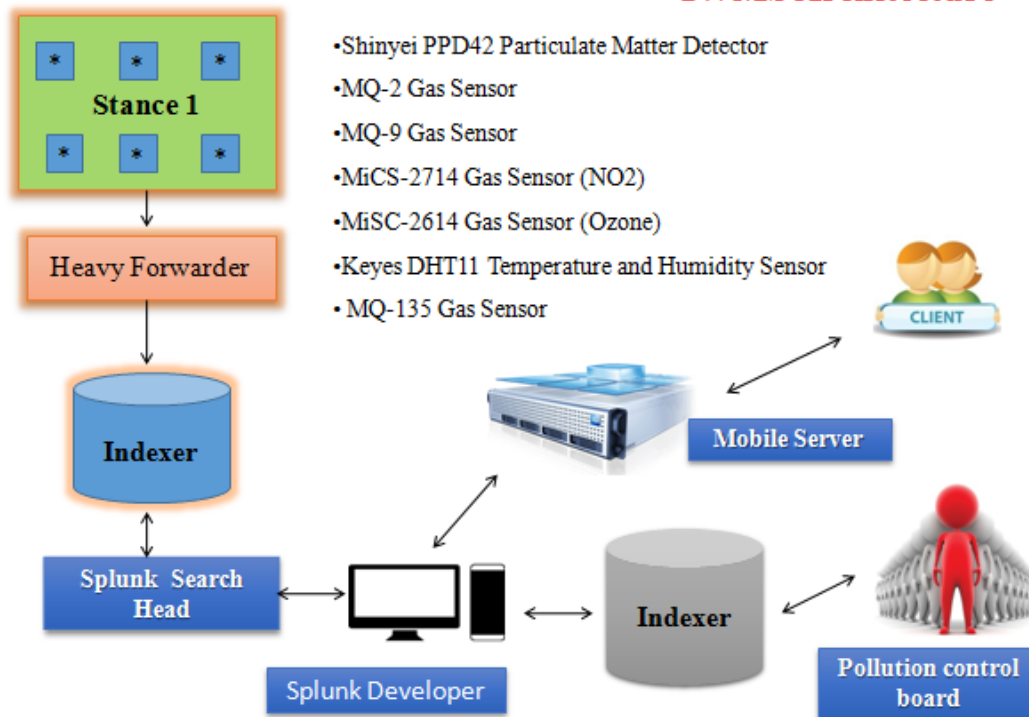
IWMS Architecture

- Shinyei PPD42 Particulate Matter Detector
- MQ-2 Gas Sensor
- MQ-9 Gas Sensor
- MiCS-2714 Gas Sensor (NO2)
- MiSC-2614 Gas Sensor (Ozone)
- Keyes DHT11 Temperature and Humidity Sensor
- MQ-135 Gas Sensor

Fig. 2. IWMS Architecture [For one company]

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V. CONCLUSION

To evade the difficulty of Industrial waste management (smoke disposal), this method is well suited. IWMS monitors the entire smoke disposal. The distributed sensor nodes help in capturing the smoke emitted at diverse levels/ locations. IWMS make a good sense for environment fortification. The best eminence automation on greenhouse atmospheric gas tracking and controlled emission are very essential by the Implementation of IWMS innovation to an industry that emits smoke, for better environment enrichment. IWMS overcome the boundaries of existing methodologies by monitoring it via distributed sensor network. IWMS thus renders adequate records of periodic monitoring. This proposed scheme helps the state pollution control board to keep track on the smoke pollutants emitted from a certain region. This report has the overall well-defined architecture of IWMS. IWMS system provides relatively enough information and provision for future enhancements.

FURTHER ENHANCEMENT

i. The suggested scheme can be practically set out
ii. The critical condition for self-recovery in case of any network failure needs to be analyzed
iii. The web pages can be translated to the languages desired
iv. The Splunk Search Head can be integrated to the mobile server to push notifications to mobiles directly

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