# Development of IOT Based Secured Emission Test

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*Abstract—* **The IoT based emission test system produces authentic digital emission test certificates. The objective is to overcome some of the disadvantages of the current emission test system where the sensor values are easily altered in the certificates in order to avoid vehicle servicing overhead in case of exceeding the standard emission threshold. Current system of emission test certificate generation requires manually collecting the sensor readings and generating paper-based certificates where veracity of the information on the certificate is not ensured. The proposed technology automatically collects the sensor readings, encrypts the sensor data along with vehicle details and transferring data to the certification authority (CA) for processing over the cloud. The CA is responsible for verifying the authenticity of received data, producing corresponding results and making it available to the authenticated users. This technology induces efficiency, authenticity and integrity by minimizing the manual work.**

*Keywords— Cloud, IoT, Arduino, Raspberry Pi, CA.*

## I. INTRODUCTION

Smoke sensor is a device that measures the emission level of Carbon monoxide, Nitrogen and hydrogen by a vehicle. Internet of Things(IoT) based emission test system collects data from smoke sensors, encrypt the data and send it to certification authority (CA) via cloud using Arduino[2] or Raspberry Pi. This project saves paper work at the emission test center (ETC) and more importantly avoids breach of integrity of data in the system. CA plays a major role in producing certificates based on the current emission standards and verifying the received data with its own customer database to provide authenticity. This IoT based system makes the process more efficient and simpler for both the ETC and the vehicle owners. The workers at the ETC only need to collect the data and feed the required user information to the UI. The vehicle owners get an easy, digital access to the emission test certificate through mobile devices.

### A. Existing System

Existing system is based on manual collection of sensor readings and certification production. One of the disadvantages of the existing system is that it has no way to Detect whether the integrity of the data has been compromised. Vehicle owners can easily bribe the ETC workers to obtain results that conform to the emission standards. Along with the increased manual work, this system also has negative impacts on the environment.

In recent years, air pollution has acquired critical dimensions and the air quality in most Indian cities that monitor outdoor air pollution fail to meet WHO guidelines for safe levels. The increasing number of vehicles on road has given way to elevated levels of pollution that has lead to numerous respiratory diseases. Hence, the current system prevents the fair process of generating certificates and indirectly leads to increased air pollution that makes way for health hazards.

### B. Proposed System

This project proposes a secured mechanism of collecting the sensor readings thus avoiding any third party intervention at the emission testing agency. The sensor readings and the vehicle number is encrypted in the Raspberry Pi (IOT) or Arduino using secured symmetric key algorithms.

The encrypted data is sent to the certificate authority over the cloud. The certificate authority will decrypt the data

and extracts the vehicle number and maps it to find a match in the database. Entire details about the vehicle is retrieved from the database. Then the sensor readings are compared with the respective value in the data sheet. The data sheet consists of the emission limits for particular type of vehicle. If the received data is lesser than the limit, then the vehicle passes the test and vice versa. Then the certificate is generated which consists of the result and the respective vehicle details. This certificate is then sent to the authenticated user via email
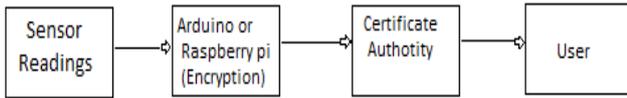


### C. Literature Survey

1. Topic: Application of AES algorithm for data security in serial communication (August 2016)[1]
   a. In embedded system UART (Universal Asynchronous Receiver Transmitter) is widely used in serial data communication to support full duplex serial communication. The UART is an integrated circuit which handles the conversation between serial and parallel data.
   b. Hardware and software implementations of AES algorithm in UART is carried out for data security.
2. Topic: Overview of India's vehicle emission control program- Past success and future prospects(22nd July 2014)[2]
   a. The ministry of petroleum and natural gas created an expert committee on "Auto fuel Vision and policy-2025". This committee can make recommendations for programs to reduce emission from in-use vehicles and move away from conventional gasoline and diesel to cleaner alternative fuels.
   b. ES-6, ES-7 emission standards across the country could reduce net emission of nitrogen oxide and Particulate matter (PM) emission significantly by 86 percent under the world class program.

### D. Requirements and Specifications

1. Software Specification:
   a. Front End: Win Forms using Visual Studio 2010
   b. Back End: SQL Server 2005
   c. Programming Language:C#(C Sharp)

2. Hardware Specification:
Raspberry pi- Raspberry pi 3 Model B has 1.2GHz 64-bit quad-core ARM Cortex-A53 CPU.

- Integrated 8Bluetooth 4.1. Energy efficient hardware - Do more but consume lesser power

   a. Arduino- The Arduino Uno Rev3 is a micro controller board based on the ATmega328 (datasheet).

- It has 14 digital input/output pins
   b. Smoke sensors- MQ2

- Continuous analog output

- 3-pin interlock connector

- Low cost and compact size
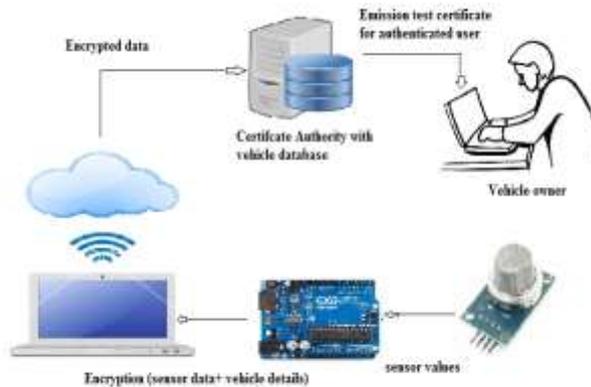
### E. Sequence Diagram of emission testing agency
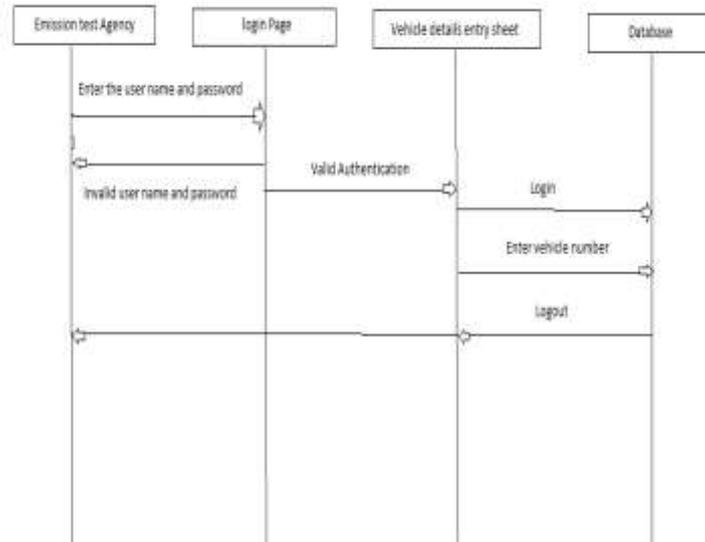


### F. Sequence Diagram of certificate authority
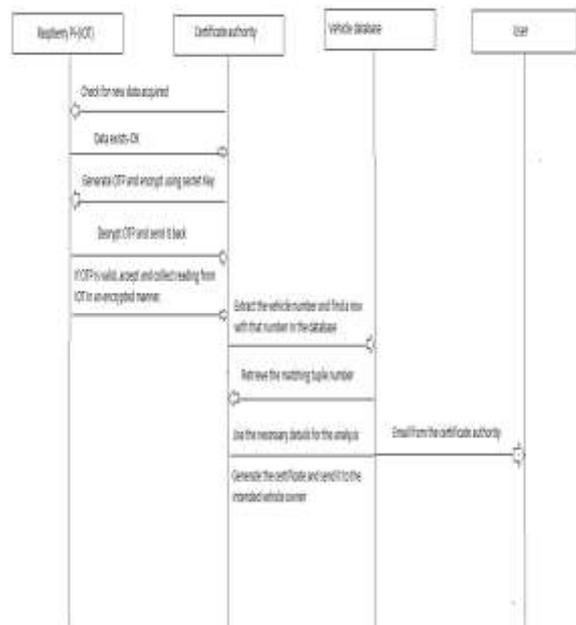
*G. Data flow diagram at the certification authority*



*H. Design*



*I. Features and Benefits of our system*

1. Accurate sensor readings and processing data
2. Minimized manual work
3. Improved security
4. Efficient encryption of sensor readings

## II. CONCLUSION

The IoT based emission test system is an efficient and reliable system that ensures that the data collected by the smoke sensors at the ETC is accurate and the integrity is maintained. The system addresses two important disadvantages of the existing system; firstly, the system avoids a huge amount of paper work and automates the certificate generation through digitalizing the process. Secondly, the system ensures that the sensor readings are not manipulated. This improved mechanism will help in controlling the amount of smoke emission through vehicles into the environment and gradually will help reduce the air pollution that is one of the major environmental issues.

## REFERENCES

[1] Application of AES algorithm for data security in serial communication (2016)

[2] Overview of India's vehicle emission control program- Past success and future prospects

[3] www.arduino.cc

[4] www.java2s.com

[5] www.tutorialspoint.com

[6] www.w3schools.com

[7] www.javatpoint.com