



Smart E-Lock for Industry Oriented Transportation

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Abstract: Nowadays Internet of Things (IOT) technology plays a vital role in all aspects of human's life. Lock system is one of those aspect that has been impacted by the massive development of IOT. At present thefts from goods carrying vehicles are a major problem faced by the owners, for example, on the way to the destination the vehicles carrying laptops are stolen by unknown person is the major problem faced by the owners. Hence, there is a need for effective and secure locks in goods carrying container trucks. This lock system which is applied in goods carrying vehicles will help to reduce theft rate. This project involves smart phone app, cloud, web application, RESTful API, hardware with GPS and GPRS, Bluetooth low energy (BLE) and actuators. This project develops a lock for the container and the lock will be opened only to the authenticated person by the use of key generated. In case of unauthenticated person the door will remain closed. It can also deliver message to the mobile device about the distance.

Keywords: RESTful API, BLE, smart phone app

I. INTRODUCTION

Cargo theft is an international problem affecting consumers and business alike thefts from goods carrying vehicles especially fuel tankers are a major problem faced by the owners. Hence, there is a need for effective and secure locks in goods carrying container trucks and fuel carrying tankers which will help to reduce the theft rate. In this paper dynamic keys are generated. With Super e-locks which works on dynamic e-key and geofence, no one can proxy and open the locks. The consignment deliveries are delayed for many reasons, the owner can monitor whereabouts of the consignment by live tracking on his smart phone. Be with your consignment/vehicle any time anywhere. The lock shall get authenticated with a valid e-key only at predefined locations. Only the authorized smart phone user can unlock the lock at the predefined destination using SMART phones. The objective of our project is to overcome the huge pilferage in consignments delivery trucks.

II. EXISTING SYSYEM

The authors Archana M, Gayathri G D, Jayabharathi R, Jayasudha I in their paper called Smart door locker security system using IOT. It touched down upon the current scenario of security in such existing systems, possible threats to the IOT system and some solutions to mitigate them. The open source Software and Hardware is used to complete a task. It can also deliver alert message to the mobile device and alarmed when the door lock is physically damaged and any fire in the house. By Using Arduino Uno method, user will open your door only when

the right password is entered and it will start beeping when a wrong password is entered.

The authors Megan Fuller, Madeline Jenkins, Katrine Tjolsen in their paper called Security Analysis of the August Smart Lock these research papers focus on the security aspect of Bluetooth operated August Smart Lock system. It is a household security lock system with its own security features and a security policy.

Users in the category owner have permission:

- Lock and unlock the door
- Enable auto locking/unlocking
- Revoke GUEST or OWNER status from other users

The authors Muhammad Sabrin Hadis and Elyas palantei, Amil Ahmad Ilham and Akbar Hendra in their paper called Design of Smart Lock Systems for Doors with Special Features using Bluetooth Technology analyzed that there is development of webpage and Bluetooth app known as user interface with the lock system which further communicates with the server via Wi-Fi. There is a security feature for the system defined by the means of Bluetooth signal area and validation area (defined as 1 m radius around door lock). If the user of access is near by the door using the lock system, then it will be opened automatically and the other way around. Therefore, the user does not need to do an action to open or lock the door. Bluetooth has lower power compared to WIFI connectivity and better security.



Cargo theft is the situation where perpetrators are stealing trucks and transport trailers full of merchandise, which can be worth thousands of dollars, they offload the cargo, parcel it and sell it for a quick profit. This often occurs before the crime is even reported. The password key is used for door locking in the consignment then a static password is used. In existing system, the key entering mechanism is already present. It has static key operation. This system does not have security system. There is no Geo-fence operation. Static passwords are reusable passwords that may or may not expire. They are typically user-generated and work best when combined with another authentication type such as a smart card or biometric control.

These methods includes

- Eavesdropping
- Dictionary attack
- Social engineering attack
- Phishing

III. PROPOSED SYSTEM

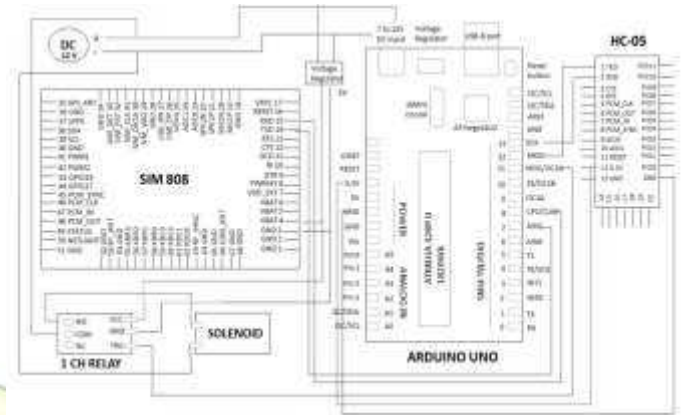
The proposed system leverages the current advancements in IoT technologies by overcoming two major disadvantages of existing key lock mechanism in consignment safety.

1. Generating dynamic fail proof passcode to open the safe door.
2. Generates the passcode only on the defined destinations – Geo unlocking feature.
3. Unlock only by authorized personnel.

The lock and unlock keys are generated dynamically and are alive for short duration so that no one misuse it. Using the Bluetooth application the locks are unlocked only at the destination point by authorized persons within a proximity.

- ✓ **GEO FENCING:** The major advantage in our project. Geo fencing location-based services in which an app or other software uses GPS, RFID, wifi or cellular data to trigger a pre-programmed action when a mobile device or RFID tag enters or exists a virtual boundary set up around a geographical location, known as geo fence.
- ✓ Some geo fences are set up to monitor activity in secure areas, allowing management to see alerts when anyone enters or leaves a specific area.

Circuit diagram:



Functional components

• Hardware components

1. **SIM808 Module** - SIM808 module is a complete Quad-Band GSM/GPRS module which combines GPS technology for satellite navigation.
2. **Arduino Uno Module** - microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button
3. **HC-05 Bluetooth Module** - Serial Bluetooth module for and other microcontrollers. Operating Voltage-4V to 6V

• Software components

1. **AT Commands** - Commands which are used to control the modems. Every wireless as well as the dial up modems, require an AT commands to interact with a computer machine.
2. **Arduino Programming** - Arduino Programming is done using the application called Arduino Integrated Development Environment (IDE) which is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++.
3. **Cloud Server** - A cloud server is a virtual server (rather than a physical server) running in a cloud computing environment. It has all the software they require to run and can function as independent units. **Cloud MQTT** - a



cloud platform to store our data (dynamic passkey) and retrieve the data. **Cloud MQTT are managed Mosquitto servers in the cloud.**

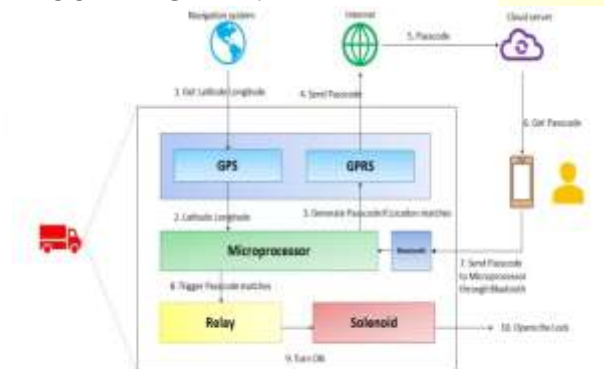
4. Android Mobile Applications - It is used to receive messages from server.

5. Actuators - turns control signal in to movement. This makes the solenoid lock to move

6. Solenoid Door Lock - Solenoids are basically electromagnets: they are made of a big coil of copper wire with an armature (a slug of metal) in the middle. When the coil is energized, the slug is pulled into the centre of the coil. This makes the solenoid able to pull from one end.

7. MQTT - Lightweight message queuing protocol and transport protocol. It allows you to send commands to control outputs, read and publish data from sensor nodes.

BLOCK DIAGRAM :



key and location. The generated key will be lasted only for 10 seconds to lock/unlock.

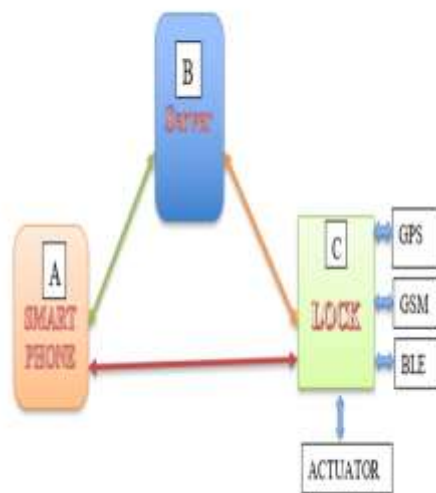
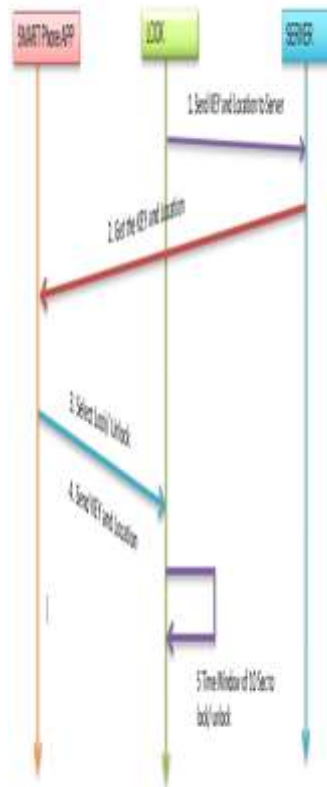
GPS unavailability:

It's kind of store and push model. As the network get lost, the location is stored in the log file every 2 minutes and that shall be pushed to the server when network reachability is there. Also SMS service can be utilized.

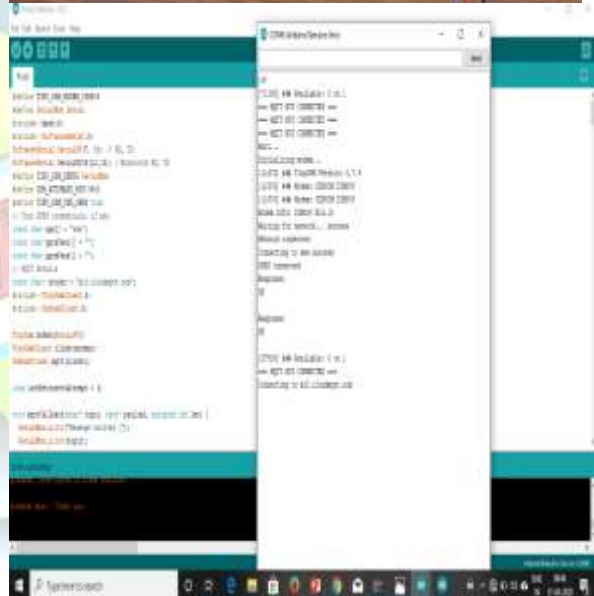
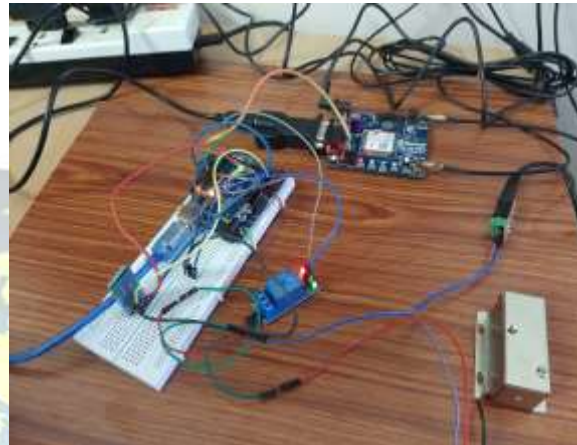
Data flow and Sequence diagram

Working principle:

At first the lock send key and location to the server by using GPS and GSM. The lock will generate the dynamic key every once in 2 minutes. The server store the pin generated from the lock and store the starting and destination location information from the server. The smart phone app get the key and location. The app selects whether the lock is locked or unlocked and then send the appropriate



RESULT:



IV. CONCLUSION

A BLE based smart e-lock system has been designed and developed catering to the issue of pilferage and thefts in the goods and fuel carrying vehicles. It utilizes a lock control system integrated to GSM and GPRS modules which help to generate the location information and communication establishment with the



cloud respectively. This information helps to track the vehicle as well as prevents theft of goods. Dynamic key used for user authentication helps to prevent unauthorized access to the lock system. The prototype developed showcases the scaled down version of this system and there is a lot of scope of improvement and addition as well as make it more cost effective and production friendly so that it is affordable to all the sections of users.

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