SMART LPG CYLINDER MANAGEMENT SYSTEM USING CLOUD COMPUTING

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Introduction:

LPG gas utilization is very high in India for both commercial and domestic purposes. The global LPG business depended highly on cylinders. LPG companies will often contract out the delivery of these cylinders - through a chain of distributors, dealers, agents and retailers - to reach their customers. Control over the cylinder, after it leaves the filling plant, is a challenge for LPG companies, and this control diminishes as it moves through the distribution chain.

The distribution chain is under threat due to the reasons listed below:

1. In the current system for delivering commercial LPG cylinders, there is no common place where all the data on sales and the customer details are stored and easily accessible.
2. The agent should be trusted to deliver the cylinders to the right customers with requested quantity and promptly hand over the amount to the enterprise.
3. All accounting is recorded on books, which can be easily manipulated by anyone and human errors are possible.
4. Accidentally misplacing the books is also a possibility. This results in significant losses for the company.

Due to the listed activities, it reduces overall ROI of the Gas business and creates a loss. This is high time for a business to review its model and make a substantial change to bounce back to retain its value proposition and off set present losses.

We wanted to develop a system that address the above issues and helps in creating value-added services for distributers/agencies and gain more margin to have sustainable business.

Objectives:
1. To create centralized storage for enterprise operations on cloud.
2. Develop remote inventory management feature.
3. Provide automatic accounting feature for sales and purchases.
4. Create customer authentication model with dynamic pricing.
5. Provide fleet management service for delivery agent tracking using IoT.
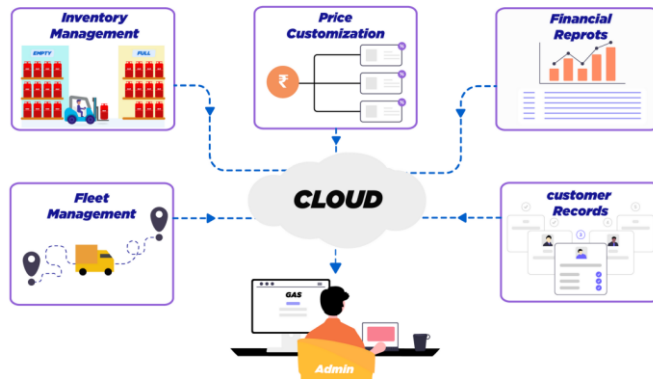
Methodology:

Fig.1: Admin Interface

1. The interface for the system is a web application to access all the features as shown in Fig.1.
2. The application is written in ReactJS.
3. The data is stored in and retrieved from Firestore, a Google cloud service.
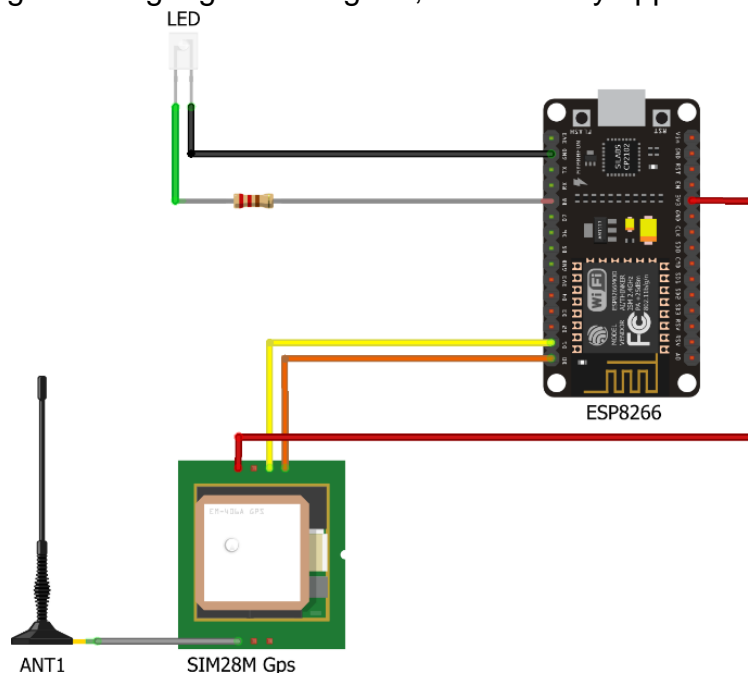4. UI/UX is designed using Figma for a good, user-friendly application.

Fig.2: IoT module for geo tracking

5. The fleet management uses IoT module with GPS as shown in Fig.2.
6. The microcontroller used is ESP8266 NodeMCU and programmed using Arduino IDE.
7. The location data is stored in Firebase real-time database, a Google cloud service.
8. The web application is used to retrieve data and displayed using Tomtom maps API.

Conclusion:

Based on the obtained results we can conclude that the proposed solution has several advantages concerning the delivery, data, accounts and finances of the LPG cylinder agency:

1. The system helps to maintain the records of the customer.
2. Agency may verify how many cylinders are in the inventory and   manage them accordingly using inventory management service.
3. Accounting is automated on day-to-day basis.
4. Delivery vehicle can be monitored using fleet management services which is integrated in system.
   The delivery chain is more transparent to the enterprise.

Scope for future work:

1. The Ministry of Petroleum and Natural gas to be approached to implement this system.
2. The system to be used for agencies that need delivery management, fleet management, accounting or finance tools.
3. Customer portal to be implemented to order, schedule and track their orders as per their convenience.
4. Better safety protocols can be implemented by using machine learning.
5. Cameras can be implemented to vehicles and warehouses which can be accessed by the admin.