

# Real-Time Tracking System for Packages using GPS and GSM Modules

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**Abstract:** The creation of a real-time package tracking system using GPS and GSM technologies is presented in this study. With the system's exact location updates for shipments in transit, misplacement risks are decreased, and logistics are improved. Accurate geolocation data is provided by GPS technology, and in real-time, this information is transmitted to a central server using the GSM module. With a smartphone or online application, users may track the package's progress from dispatch until delivery, guaranteeing complete visibility.

This system improves package tracking's effectiveness, transparency, and dependability to address typical delivery service issues. The experimental results demonstrate the system's great accuracy and reactivity in various settings, underscoring the possibility of its widespread use in the logistics sector.

## I. INTRODUCTION

The fast growth of e-trade and logistics has significantly increased the demand for green and cozy shipping structures. traditional monitoring methods, which depend upon manual updates at checkpoints, are regularly insufficient, leading to issues together with not on time deliveries or out of place applications. those challenges highlight the importance of real-time visibility all through the delivery system.

In reaction, present day package monitoring structures have evolved, incorporating superior technologies like GPS and GSM to offer non-stop, real-time updates on the region of shipments. GPS (worldwide Positioning system) permits unique place tracking, while GSM (international device for cell Communications) facilitates verbal exchange between the monitoring gadgets and the important servers. via integrating those technology, real-time package monitoring systems offer full-size advantages.

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advantages, along with progressed accuracy in estimating transport times, more suitable protection via minimizing the hazard of package deal loss, and higher client pride with obvious and timely updates.

This innovation guarantees that each clients and businesses can display shipments at every level of the journey, enabling a higher diploma of control and duty. As e-commerce continues to develop, the call for for real-time tracking systems leveraging GPS and GSM modules will in all likelihood end up an industry general, setting new expectations for logistical performance and reliability.

## II. RELATED WORKS

Real-time tracking systems, in particular the use of GPS and GSM technologies for asset management and logistics, have been the subject of numerous research and projects. Several noteworthy works about real-time package tracking systems are listed below

1. GPS and GSM-based totally car tracking systems one of the earliest implementations of GPS and GSM generation changed into in vehicle monitoring systems, which laid the muse for package monitoring. those structures use GPS for actual-time region updates and GSM networks for information transmission to a crucial server. some projects have additionally integrated Google Maps for a extra user-pleasant interface. This paintings paved the way for logistics organizations to undertake similar technology for bundle monitoring.

2. IoT-Enabled tracking devices

The internet of factors (IoT) has played a chief role in enhancing real-time tracking structures. Researchers have explored the usage of IoT-based totally GPS and GSM modules to allow smarter tracking devices that no longer best relay vicinity data however and also collect.

### 3. Optimizing power performance in GSM-based Trackers.

A key mission in developing GPS-GSM tracking systems is power consumption. studies have explored strength-green algorithms for GPS/GSM tracking systems to prolong battery existence. this is mainly critical for structures in which the tool can be in transit for prolonged intervals. several works advocate optimization strategies inclusive of sending region statistics at specific durations, the usage of sleep modes, or incorporating low-energy communicate protocols like LTE-M and NB-IoT.

4. Hybrid tracking structures (GPS, GSM, and RFID) some researchers have proposed hybrid monitoring structures that integrate GPS, GSM, and RFID (Radio-Frequency identification) technologies. GPS provides real-time location, GSM handles conversation, and RFID tags make sure that packages can be tracked even if GPS signals are weak, consisting of in warehouses or shipping containers. these structures provide greater comprehensive tracking skills by means of covering each outside and indoor environments.

5. Cellular application-based totally tracking answers Many real-time package tracking systems combine with mobile applications, permitting users to monitor their programs via smartphones. research in this place specializes in growing user-friendly interfaces and enhancing the backend facts go with the flow from the GPS and GSM modules to the app. WebSocket, rest APIs, and MQTT are common technologies used to facilitate real-time communication among monitoring devices and the mobile or net apps.

6. Blockchain-integrated package tracking recent studies have explored integrating blockchain with GPS and GSM-based totally monitoring structures to decorate statistics protection. these systems make sure that the location information, once transmitted, is immutable and transparent, presenting a further layer of accept as true with and safety. This has been mainly valuable for high-cost shipments and touchy deliveries wherein tampering with bundle facts is a situation.

7. Real-Time indicators and Geofencing studies has also focused on improving the intelligence of monitoring systems via introducing features which include geofencing. GPS and GSM-based totally systems can cause signals while a

package enters or exits predefined geographical areas, enhancing the precision of delivery updates. actual-time alerts via SMS or push notifications additionally decorate consumer engagement, allowing customers or groups to take instant motion if a package deviates from its direction.

### III. PROPOSED SYSTEM

By continuously providing location updates and enhancing the effectiveness of logistics operations, the suggested real-time package tracking system seeks to address the shortcomings of conventional tracking techniques.

The Global Positioning System (GPS) and Global System for Mobile Communications (GSM) are integrated into the system to track packages while they are in transit and provide users with real-time information through mobile and online applications. The layout and features of the suggested system are broken as follows:

GPS and GSM technologies are integrated into the real-time package tracking system to give precise and ongoing package monitoring while it is in transit. The system's features, which include real-time tracking, decreased wait times, and improved package security, are intended to increase the effectiveness and transparency of logistical operations. It is comprised of a tiny hardware component that is attached to the package and transmits location information to a central server that consumers can access through application.

The GPS module, which frequently gets the package's precise geographic location, is the system's fundamental component. The position data is subsequently sent to the central server via cellular networks using the GSM module, which serves as a communication bridge. The central server was created utilizing an online platform such that the data is processed and stored by Node.js. Users can view this data on an easy-to-use interface that gives them real-time visibility into the package's trip on a digital map that is driven by Google Maps API.

The system's primary features include notifications for geofencing, real-time position updates, and the opportunity to see the package's whole transit history.

### IV LITERATURE REVIEW

We conducted a survey on the Teacher Information Management System By Government of Meghalaya and Teacher Transfer Management System (TTMS) by Education Department of Assam and Government Of Maharashtra.

Teacher Information Management System By Government Of Meghalaya

The TIMS (Teacher Information Management Systems) Project has been launched by the Meghalaya govern-

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A prototype for image categorization or image identification only determines a likelihood that the item is present in the picture. As opposed to, item placing refers to pinpointing a specific object's location within an image[2]

Chen et al. Concentrated on the power performance improvement of GSM-based trackers, where they presented the sleep scheduling algorithms that reduce how often GPS and GPRS transmissions to extend their battery life in events when there is no movement. Their method can indeed prolong battery life enough to use it on a long term basis in remote tracking systems [3].

Wang et al. introduced a hybrid tracking system that included GPS, GSM and RFID protocols. The GPS accuracy is even more robust in environments where integrated positional tracking using visible light from LED's as opposed to cameras would be reduce the effective operating range or limited areas of use. In particular, RFID offers better short-range tracking surrounding the infrastructure in a complicated environment [4].

Sharma et al. Create a mobile solution that uses GPS and GSM to provide real-time updates to mobile applications. Their application allows users to set up geofences and receive notifications when vehicles enter or exit a specific area. This solution is ideal for single users and large fleets, and provides users with social and cloud integration for data management [5].

In the field of security and information transparency, Tian et al. proposed a blockchain-integrated package tracking system. The system increases the transparency and security of tracking information by ensuring that all updates are recorded on an immutable blockchain. This approach is particularly

useful for connected devices because it reduces the risk of interference and increases stakeholder accountability [6].

GPS and GSM-based vehicle tracking capabilities have been developed to define a virtual area. When the vehicle exceeds these limits, the system sends an instant alert to the user, increasing security and enabling immediate maintenance [7].

Gatkine, Sakshi, Imran, Ahmad, et al.(2023) [18] in Teacher Management System web app is developed to manage teaching related task.

Gupta, Narayani, Imran, Ahmad, et al.(2023) [17] In this Object Detection using YOLO-I-Sight is used to detection the object.



GPS Tracker



Mobile GPS

Fig No1. Hardware Devices

Mobile GPS: technology uses satellite signals to determine geographic location for real-time location tracking. It is widely used in mobile applications for navigation, fleet management, and location-based services.



Fig No2. Illustration of tools & software used

**Node.js:** Acts as a backend server, handles API requests, and manages data communication between the frontend and database (MongoDB). Works well in real-time data streaming for location-based services.

**Google Maps API:** Provides real-time visibility of tracking devices by integrating maps and location services into applications. This API provides geolocation and map functionality to the front end.

**MongoDB:** Store location data, user data, and tracking history in a flexible NoSQL database. MongoDB manages large data sets and real-time data

updates.

**React.js:** Powers the front-end and provides an interactive UI where users can view maps, track assets, and interact with other products. Seamlessly integrates with the Google Maps API for dynamic mapping.

**VS Code:** Provides a cloud-based development environment that enables instant collaboration, easier field development, and integrated tools for building and deploying Node.js, React, and MongoDB applications.

## V. WEB APPLICATION DESIGN

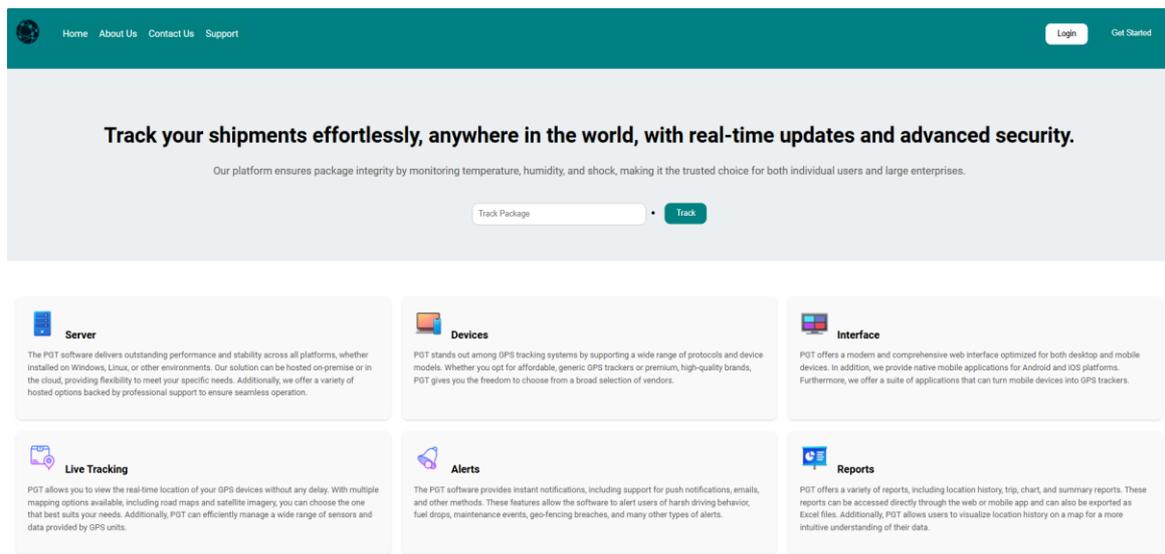


Fig No.3 Home

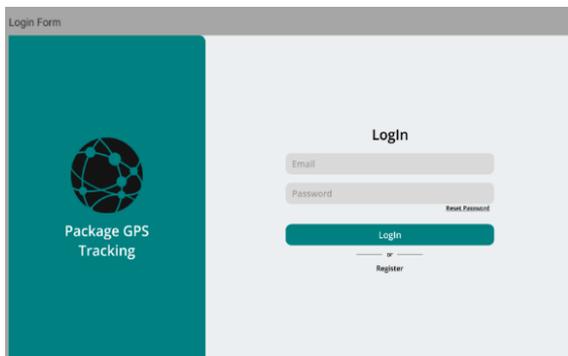


Fig No.4 Login Page

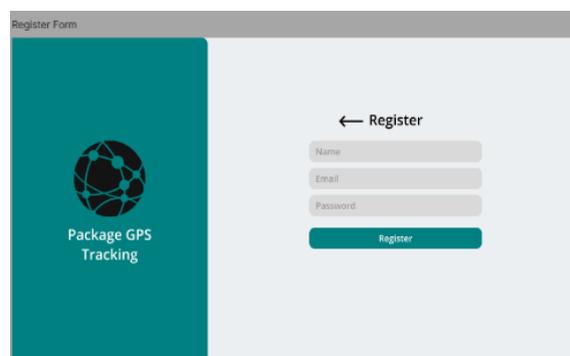


Fig No.5 Register Page

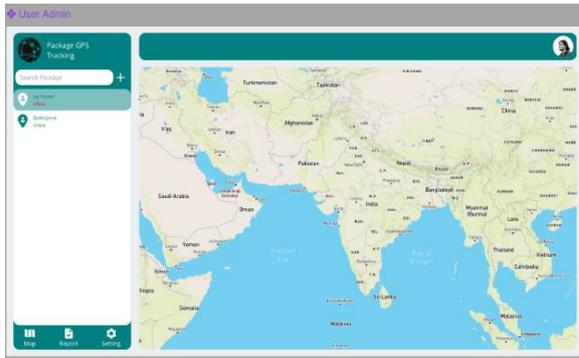


Fig No.6 Map

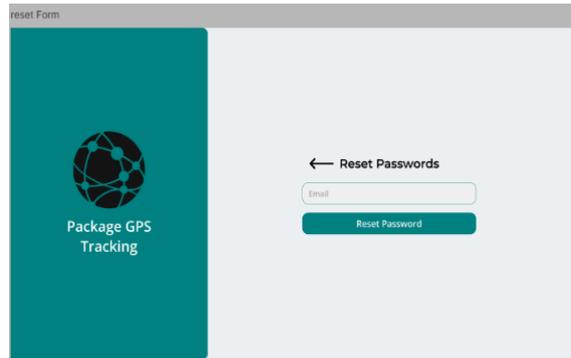


Fig No.7 Reset page

## VI METHODOLOGY

The process of creating a GPS tracking system consists of multiple crucial phases, all aimed at guaranteeing precision, dependability, and ease of use. The GPS device must first be powered on and connected before any configurations, including data update intervals and formats, may be made to guarantee optimal performance. The following phase concentrates on location acquisition, guaranteeing precise and regular location updates while resolving possible problems such as weak satellite signals and initialization delays. Reliable techniques like GSM and GPRS are used for data transfer, and error-handling systems are in place to handle transmission failures. After data is sent, a web server uses databases built to handle both historical and real-time data to process and securely store it. Next, a web application with a user-friendly interface is created, combining features.

Like map panning, zooming, and historical data filters. Real-time tracking and historical views are provided by the easily customizable, dynamic, and straightforward interface. Another major priority is security, with access control systems and encrypted data transfer guaranteeing user privacy. Lastly, strong error-handling procedures are put in place to ensure system dependability even in the event of failures or network problems. These procedures include retries and device health monitoring.

A systematic approach is used in the development of a GPS tracking system technique to guarantee the accuracy, security, and user experience of the system. GPS Tracker Initialisation is the first step, during which the hardware is powered on, linked, and set up. This involves specifying the data format and updating intervals for location data to make sure the system runs smoothly and is compatible with other operations. The system then uses fallback strategies

like Wi-Fi triangulation or Assisted GPS (A-GPS) to deal with problems like weak satellite signals or delays in receiving a fix during the Location Acquisition phase.

## VII MODULE DESCRIPTION

Initializing a GPS tracker involves making sure it is correctly attached and powered on. Set up parameters like data formats and update intervals.

Acquisition of Location: Manage possible problems like weak satellite signals or delayed device initialization. Make sure to update the location often and accurately.

Data Transmission: Select a dependable data transmission technique. Put error handling and retry procedures in place if a transmission fails.

Web application: Create an intuitive user interface that efficiently shows location data. Include functions like historical data filters and map zooming and panning.

User Interface: Make sure it is responsive and easy to use. Give users the ability to observe tracking in real time, access historical data, and alter settings.

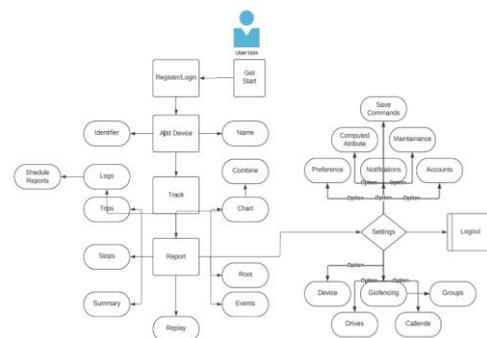


Fig no.8 Block Diagram

## VIII CONCLUSION

To sum up, tracking the movement of packages from the point of origin to the point of destination can be done quite effectively with a real-time package tracking system. The technology offers precise location updates and historical route data by combining GPS tracking, real-time data transfer, and an intuitive online and mobile interface. Reliability and convenience are guaranteed for individuals and enterprises alike through secure data processing, error management, and user-friendly features like live tracking, route history, and customizable alarms. All things considered, the solution increases customer satisfaction, streamlines logistics processes, and improves transparency.

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