IOT Based on Real Time Location Sharing and Tracking System

Amandeep Kumar
Sunil Kumar
Sandeep Rathor
Electronic and Communication
Noida Institute of Engineering and Technology
Greater Noida, Uttar Pradesh
Pradumn Kumar Gupta
Asst Prof. Department of electronic and Communication
Noida Institute of Engineering and Technology
Greater Noida,

Abstract—The development of smart technology has made it simpler and more effective to track and share whereabouts in real time. This study investigates how the Internet of Things (IoT) contributes to the development of a system that can instantaneously track and exchange location data. The position is obtained by GPS, processed by a micro-controller, and transmitted to the cloud using communication technologies like Wi-Fi or mobile networks. Users may then view the location on a website or mobile app. Vehicle tracking, personal safety, and emergency assistance are all made possible by this technology. Nevertheless, there are difficulties including network problems, energy usage, and data security. Future advancements like blockchain, 5G, and AI are also covered in the report to increase the security and dependability of monitoring systems.

Keywords—Real-time GPS tracking, Internet of Things, Cloud Computing, Android

I. INTRODUCTION

Global positioning system (GPS) technology and the Internet of Things (IoT) [1, 2] have combined in recent years to transform a number of industries, most notably transportation. GPS tracking technologies combined with Internet of Things-enabled linked cars [3] have opened up new opportunities for convenience, safety, and efficiency [4–5]. The purpose of this article is to investigate the revolutionary possibilities of real-time GPS tracking systems for Internet of Things-enabled [6]. By facilitating smooth connection and data sharing, the Internet of Things has completely changed how real-world items interact with the digital world. Connected cars can precisely ascertain their location, monitor their motions, and provide real-time data to distant computers [5, 9] by incorporating GPS technology into this IoT network [8]. The significance and advantages of combining GPS and IoT technologies in linked devices have been emphasized by earlier studies [10]. For example, prior research has shown how GPS technology makes real-time monitoring possible [11–13]. It has also been demonstrated that GPS data [19] in conjunction with IoT-based sensors enhances risk detection and warning. Additional study is required to solve integration hurdles, security concerns, and scalability issues related to linked vehicle tracking systems, even though previous studies have demonstrated the promise of IoT and GPS technologies in these systems [22, 23]. By offering a thorough examination of the features, advantages, and difficulties of real-time GPS tracking systems [24, 25] for Internet of Things-enabled linked devices, this work seeks to add to the body of current research. To sum up, this study focuses on creating a real-time GPS tracking solution for connected car networks [26], utilizing Internet of Things technologies to improve real-time monitoring and resource management. The use of certain hardware and software components, including the Arduino Nano [27], SIM800L module [28], NEO6M GPS module [29], Node.js, socket, and Firebase [30], will be highlighted in the paper's discussion of the implementation process. Additionally, it will investigate how this real-time GPS tracking

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technology may be used in other businesses. In order to create more effective and sustainable monitoring systems, the article attempts to offer insightful information about the potential and advantages of combining real-time GPS tracking with an Internet of Things-enabled linked item.

II. Methodology And Implementation

A.An explanation of the real-time GPS tracking solution's system architecture

This study used a number of different frameworks and technologies to construct a real-time GPS tracking system. In specifically, the Arduino Nano microcontroller, SIM800L GSM module, and Neo6M GPS module were used to gather and evaluate real-time position data. In Figure 1, the system architecture is displayed, demonstrates the elements and their interactions in the proposed solution. Using the GPRS protocol, the Arduino Nano R3 board talked with the SIM800L module to transmit the data to a cloud-based backend server after receiving it from the GPS module.

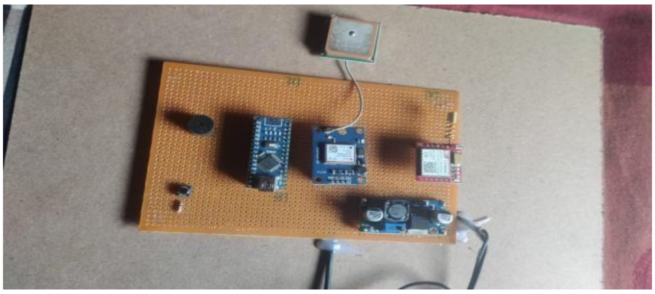

Fig-1. Experimental Set-up for Tracker

In order to physically implement the real-time GPS tracking system, the Arduino Nano, SIM800L module, and NEO6M GPS must be connected. The following is how the connections are made:

- NEO6M GPS module: VCC pin connected to the Arduino's 3.3V pin, GND pin to GND, TX pin to RX, and RX pin to TX.
- SIM800L module: VCC pin connected to the Arduino's 5V pin, GND pin to GND, TX pin to RX, and RX pin to TX.

The Arduino Nano board is powered by a USB cable that is attached to a power source, and these connections allow communication between the modules and the board.

The received location data was stored on the backend server using the Firebase Realtime Database for effective data storage. Using Node.js and Express.js, a cloud-based architecture was created to manage the frontend server capabilities. These frameworks made it easier to handle incoming data effectively and communicate with the Firebase Realtime Database. Real-time data transfer between the frontend and backend servers is also made possible by the integration of a WebSocket connection into the frontend server. On the frontend server, the Leaflet library was used to display the real-time location data. As fresh position information was obtained from the GPS module and entered into the Firebase Realtime Database, this library offered an interactive web map interface that was updated in real time. A reliable and efficient real-time GPS tracking system was created by combining the Leaflet, GPRS protocol, Firebase Realtime Database, and WebSocket connection. Through a web application, this system enables users to easily view and track the positions of the tracked. As shown in Figure 2, the smooth integration of various frameworks and technologies guarantees dependable performance and effective data processing for real-time tracking.

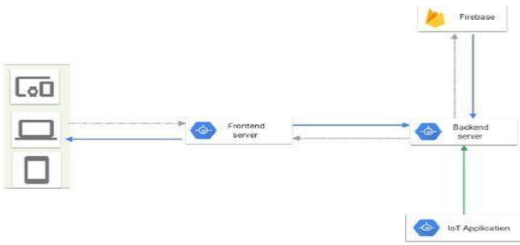

Fig-2. System Architecture

B.Implementation Process

A number of crucial elements and technologies are involved in the real-time GPS tracking solution for connected car networks' deployment process. The implementation procedure is thoroughly explained in this section.

B.1 Socket.IO

This project uses the JavaScript package Socket.IO to create a WebSocket connection between the backend server and the web application. The library makes it possible for the two entities to communicate in real time and both ways, which makes it easier for the vehicle's GPS coordinates to be transmitted and updated.

B.2 Leaflet

The online application uses an open-source JavaScript package called Leaflet to show the

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position of the car. The library offers interactive, mobile-friendly maps that are flexible, easy to use, and have configurable designs.

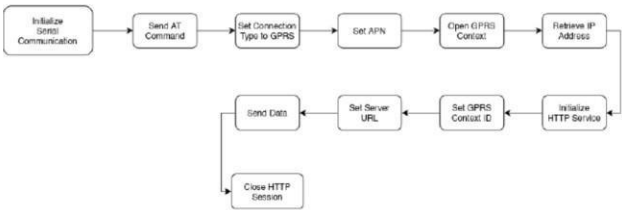
B.3 FIREBASE

GPS coordinates and other pertinent information are stored in a backend database called Firebase, which is a cloud-based platform. It was chosen because of its capacity to manage massive volumes of data, smooth interaction with Node.js, and real-time database capabilities.

B.4 ESTABLISHING AN HTTP CONNECTION

It takes a number of AT commands to create an HTTP session using the SIM800L module. The Arduino nano R3 micro-controller is used to send these commands to the module via serial connection. The system **workflow for this procedure is shown in Figure** 3.

Fig-3. System workflow for establishing an HTTP



session with the SIM800L module

The process entails the Arduino Nano R3 microcontroller serially communicating a series of AT instructions to the SIM800L module. By connecting to the network, setting the connection type, providing the Access Point Name (APN), launching a GPRS context, initializing the HTTP service, and establishing the URL for data transfer, this process allows the module to create an HTTP session. The AT+HTTP TERM command can be used to end the session. To make sure the right instructions are used, it is essential to refer to the datasheet for the module and the network

provider's documentation.

Fig-4. Workflow for Real-time GPS Tracking Solution

The software process model is shown in Figure 4. The backend server is essential to the management and processing of data in the context of GPS technology and linked cars. Through the frontend web application, the linked vehicle sends its GPS coordinates to the backend server. The backend server, which is constructed with technologies like Node.js and Express.js, receives these coordinates via an HTTP request and processes them. The backend server uses GPS data to carry out a number of tasks, such as geofencing, route optimization, and real-time tracking. Using Socket.IO, it communicates with the linked car in a smooth and effective manner. Additionally, the backend server stores and retrieves GPS-related data via integrating with other system elements, including the Firebase Realtime Database. Through this interface, customers may receive real-time updates and notifications from the backend server, guaranteeing precise tracking of the position and movements of the linked car. The backend server serves as the system's backbone, coordinating the flow of GPS data and enabling the efficient use of location-based services throughout the ecosystem of linked Devices.

III. PROPOSED SYSTEM

In locations where phones are unreliable, such as rural areas and mining areas. Even when phones are functional, accidents or other circumstances may arise where someone needs assistance but is unable to provide it. Therefore, this system uses an accelerometer and vibration sensor to identify danger and send out alerts. The code deposited will be used by these sensors to detect the fall; to verify the fall, the vibration sensor and accelerometer threshold values should be adjusted. When a fall is detected, the Arduino connects to the GPS module, obtains the latitude and longitude, and sends the information via message to the GSM sim802L module. The location will be published even if the SOS button is hit. The NEO6M GPS module will assist in transmitting the alarm in the event that cellular signals are absent. When the signal is received by the receiver NEO6M GPS module, the buzzer will ring. The

transmitter NEO6M module will broadcast the signal. As previously said, this project uses IoT to assist store the location information of past locations in situations where network coverage is insufficient to determine the position. This tracker may be used by anyone who wishes to

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communicate with others when in a panic or danger scenario.

IV. Results and Discussion

The utilization of cloud-based deployment on Counter offers significant advantages to the system, particularly with regard to scalability and availability. The capacity to seamlessly manage an expanding user base and continuous system uptime are ensured by this deployment technique. The system's straightforward accessibility through a range of internet-connected gadgets guarantees a flawless user experience. Figure 6 displays an example dataset used in the investigation.

Fig-6. Google Map Location Link

The proposed real-time GPS tracking system was successfully implemented and tested. The GPS module detected satellite signals and accurately determined the device's latitude and longitude when the system was turned on. The Arduino Nano examined this data, and the SIM800L GSM module used GPRS to send it to a cloud server.

Figure 7 displays the outcome, which plots the device's current location on Google Maps. The location data was then retrieved and shown in real time via a mobile or online interface. By sending out updates at regular intervals, the system followed the device's journey continually across many areas

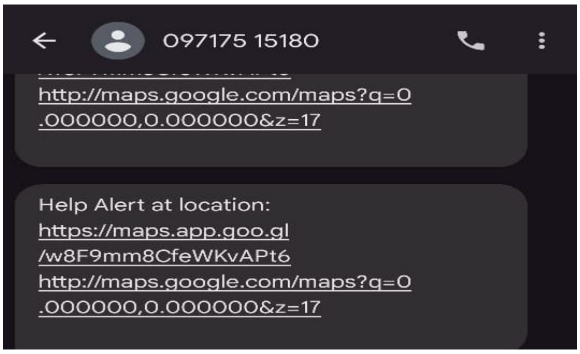

Fig-7. Message Received

V. Conclusion

An effective, safe, and reliable way to monitor the whereabouts of people, cars, and property is using the proposed IoT-based real-time location monitoring system. The solution ensures accurate and current location data by integrating cloud computing, IoT communication technologies, GPS, and AI-driven analytics. By combining encryption techniques, energy-efficient network protocols, and predictive analytics, it addresses typical issues including security risks, excessive power consumption, and connection issues. For both online and mobile users, the system provides an intuitive user interface that guarantees seamless tracking, prompt geofencing notifications, and extensive historical movement data. Because of its adaptability, it may be used to a variety of fields, including emergency response, personal safety, and logistics. Future developments could focus on enhancing predictive tracking based on artificial intelligence, increasing integration with cutting-edge technologies like edge computing and blockchain, and increasing energy efficiency.

VI. Future scope

GPS position transmission through the Internet of Things and various communication methods will be widely used in the future. Other communication methods, such as satellite and radio transmission, can be added to achieve even greater progress. Data integrity will be protected and smooth integration will be encouraged by strong security protocols and compatible standards. Future trackers will also be more precise, require less time, and use less power.

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