

# IoT Based Vehicle Tracking System Using Google Cloud Node-RED

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# Client Details

**Client Name:** [Shivam Patel]

**Country:** [Mansfield Park, Australia]

**Project Cause:** [Implementing GPS Tracking system in IoT Using Node-RED]

**Project Start Date:** [May 22nd, 2023]

**Project Completion Date:** [June 8th, 2023]

## 1 Introduction

This report describes the development and implementation of a Node-RED based Vehicle Tracking System using Google Cloud. The system integrates several APIs including Google Maps API for geocoding, WhatsApp (GoRapid API), Twilio SMS, Google Spreadsheet API, Google Maps Geocoding API, and OpenWeatherAPI. The purpose of this project is to simulate vehicle movement from a starting address to an ending address and provide real-time updates through various communication channels.

## 2 Problem Statement

In the modern world, tracking the real-time location of vehicles is essential for logistics and transportation management. The challenge lies in creating a system that not only tracks the vehicle but also provides timely updates to the concerned parties through multiple communication platforms. This project aims to solve this problem by creating a simulation of a vehicle journey using Node-RED and integrating various APIs for real-time notifications.

## 3 System Design

### 3.1 Overview

The system allows users to input the starting and ending addresses, vehicle name, and plate number through a dashboard. Upon starting the journey, the system calculates the coordinates and simulates the vehicle's movement, providing updates at each stage of the journey.

### 3.2 Components

- **Node-RED:** For creating the logic and workflows.
- **Google Cloud:** For hosting the system and using various Google APIs.
- **APIs:**
  - Google Maps API for geocoding.
  - WhatsApp (GoRapid API) for messaging.
  - Twilio SMS for text notifications.
  - Google Spreadsheet API for data logging.
  - OpenWeatherAPI for weather updates.

## 4 Implementation

### 4.1 Dashboard Input

Users enter the starting and ending addresses, vehicle name, and plate number into the Node-RED dashboard.

### 4.2 Geocoding

The Google Maps Geocoding API is used to convert addresses into coordinates. The following code snippet demonstrates this process:

```
const apiKey = "AIzaSyBgmXhWA7iSg6f8hpa9ZovnVeuJ0aQ4kXc";
const address = flow.get("Arrival_Address");
msg.url = 'https://maps.googleapis.com/maps/api/geocode/json?address=${encodeURIComponent(address)}';
return msg;
```

### 4.3 Journey Simulation

The vehicle's journey is simulated by dividing the route into six segments. The system updates the vehicle's position every five seconds, displaying the progress on the dashboard.

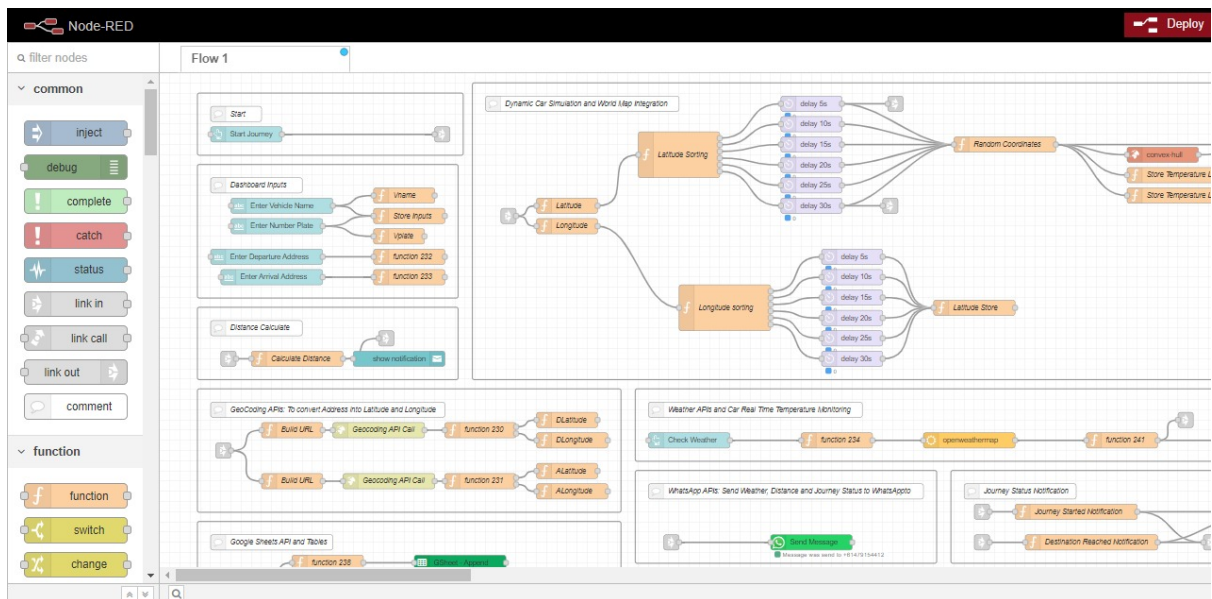


Figure 1: Tracking Backend Node-RED

### 4.4 Notifications

Notifications are sent at each stage of the journey:

- **Departure and Arrival:** Messages are sent to WhatsApp, Twilio SMS, and the dashboard.
- **Intermediate Stages:** Updates are logged in a Google Spreadsheet and displayed on the dashboard.

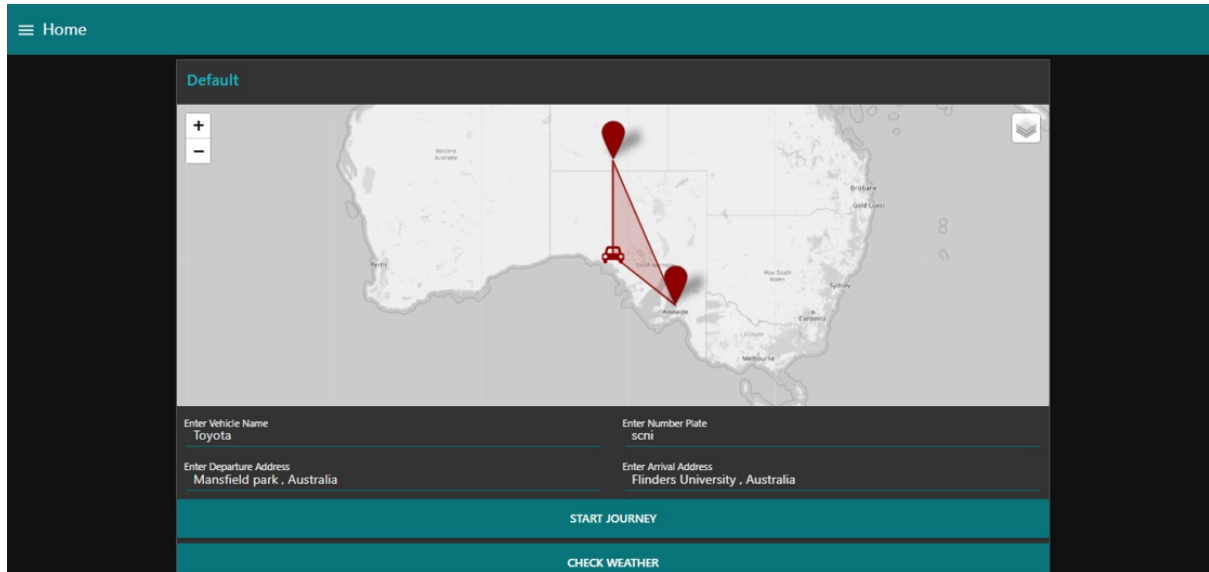


Figure 2: Frontend including World Map

## 5 API Integration

### 5.1 Google Maps API

Used for converting addresses into coordinates.

### 5.2 Google Spreadsheet API

Used for logging journey updates.

```
{
  "type": "service_account",
  "project_id": "watchful-gear-418606",
  "private_key_id": "b8aef57aea75768a435156429f9086e83f7aa404",
  "private_key": "",
  "client_email": "node-red@watchful-gear-418606.iam.gserviceaccount.com",
  "client_id": "107938234125740796695",
  "auth_uri": "https://accounts.google.com/o/oauth2/auth",
  "token_uri": "https://oauth2.googleapis.com/token",
  "auth_provider_x509_cert_url": "https://www.googleapis.com/oauth2/v1/certs",
  "client_x509_cert_url": "https://www.googleapis.com/robot/v1/metadata/x509/node-red",
  "universe_domain": "googleapis.com"
}
```

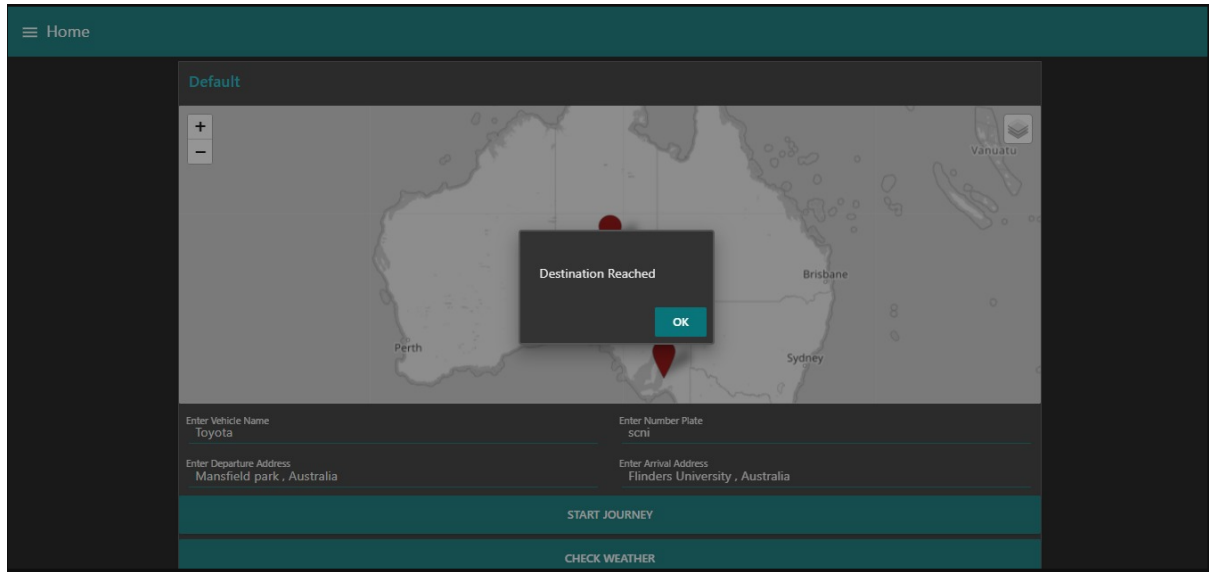


Figure 3: Frontend Dashboard

### 5.3 WhatsApp (GoRapid API) and Twilio SMS

Used for sending notifications.

## 6 Results

The system successfully simulates vehicle movement and provides real-time updates through various communication channels. The dashboard displays the vehicle's progress, and notifications are sent at departure, arrival, and intermediate stages.

## 7 Conclusion

The Node-RED based Vehicle Tracking System effectively demonstrates the integration of various APIs to create a real-time vehicle tracking simulation. The project showcases the potential of using Node-RED and Google Cloud for developing IoT applications that require real-time data processing and communication.