

Geofence Areas: Smart Location Management for Your Vehicles

1. Executive Summary

This report introduces "Geofence Areas," a powerful feature designed to give you precise control and insights over your vehicle movements. By setting up virtual boundaries on a map, you can automatically track when vehicles enter or exit specific locations, receive instant alerts, and ensure compliance with defined routes or speed limits. This system simplifies monitoring, enhances security, and automates tracking processes, providing peace of mind and operational efficiency without needing constant manual oversight.

2. Introduction

Managing a fleet or tracking valuable assets often comes with challenges like ensuring vehicles stay on designated routes, monitoring their presence in key areas, or enforcing speed limits. Traditional methods can be time-consuming and prone to human error.

Geofence Areas addresses these challenges by allowing you to define virtual perimeters around any real-world location. Think of it as creating an invisible tripwire on a map. When a vehicle, equipped with a GPS tracker, crosses this boundary, the system automatically detects the event and can trigger various actions, such as sending alerts or updating records.

This feature is designed to be straightforward and immensely beneficial for users, helping you gain better control over your operations.

Key Definitions:

- **Geofence:** A virtual boundary around a real-world geographic area. When a vehicle enters or exits this boundary, it can trigger an action or alert. For example, your app could notify a customer when a delivery driver enters their neighborhood.
- **Transportation Geofence:** A broader, global virtual boundary set up for customer accounts, like around warehouses, delivery zones, highways, or restricted areas. Customers can define these areas for their specific needs.
- **Trip Geofence:** A virtual boundary specifically defined for a particular trip or journey, located within a larger transportation geofence. For instance, you could create a Trip Geofence for a route from City 'A' to City 'B' to monitor if a vehicle follows the defined path, enters restricted zones, or reaches checkpoints during that specific journey.

3. Main Content (User-Focused Sections)

What This Means for You

Implementing Geofence Areas brings several practical benefits:

- **Enhanced Security:** Get immediate alerts if a vehicle enters or exits an unauthorized zone.
- **Improved Efficiency:** Automate tracking and monitoring, reducing the need for manual checks.
- **Better Compliance:** Easily enforce speed limits within specific areas or ensure vehicles stick to predefined routes.
- **Real-time Insights:** Understand vehicle movements in relation to important locations instantly.
- **Automated Communication:** Set up notifications for customers or internal teams based on vehicle location changes.
- **Optimized Operations:** Quickly identify deviations from planned routes or schedules.

How It Works

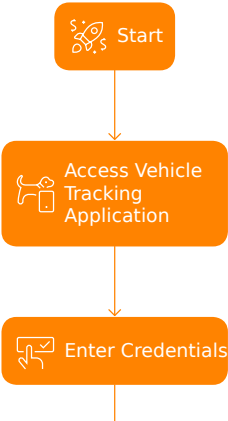
The Geofence Areas feature in your application allows you to manage virtual boundaries with ease. The general workflow involves adding a new geofence, which can be customized in various shapes (circular, rectangular, or

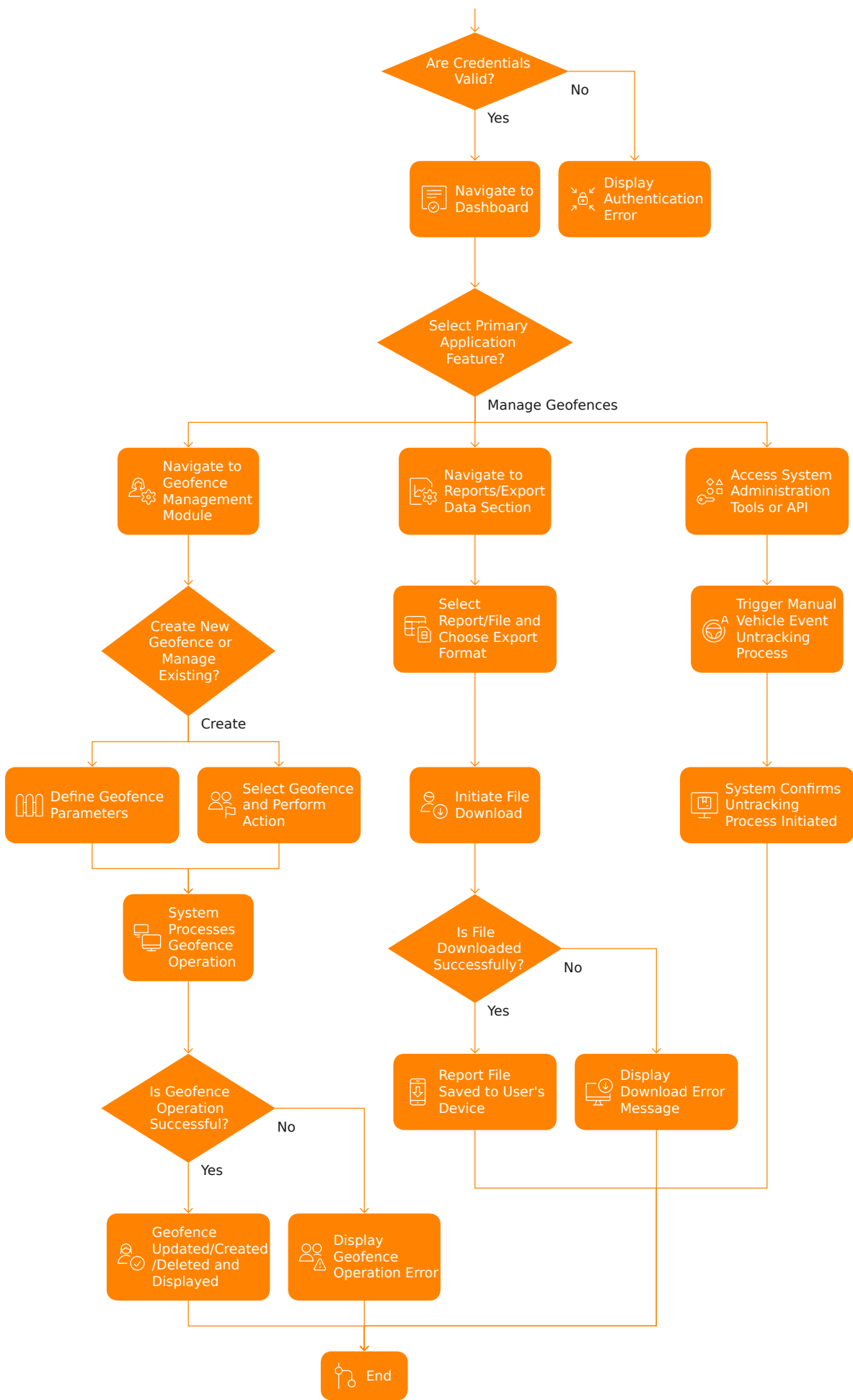
polygon) and details (like speed limits). Once created, you can view its details on a map, update its properties, or remove it as needed. The system also includes automated processes to manage vehicle event tracking efficiently.

The flowchart below illustrates the core process of managing Geofence Areas:



Geofence Areas Submodule Flowchart





Getting Started

Follow these steps to effectively manage your geofence areas:

1. Access the Geofence Areas Submodule:

- **Log in** to the Vehicle Tracking App with your valid credentials.
- Navigate to the **Master Data** module.
- Select the **"Geofence areas"** submodule.

2. Add a New Geofence Area:

- On the Geofence Areas page, click the **" + Add Geofence"** button.
- On the "Add Geofence" form, you will need to:
 - **Select** the Parent Area from the dropdown.
 - **Enter** the Geofence Area Name (e.g., "Main Warehouse," "Delivery Zone A").
 - **Enter** the Address for the geofence.
 - **Enter** a Landmark (optional, for easier identification).
 - **Enter** the City/State.
 - **Enter** the Country.
 - **Select** the Area Speed Limit.
 - **Use the map drawing tools** to define the geofence shape (circular, rectangle, or polygon) by setting coordinates or drawing directly.
- Finally, click the **"Submit"** button to add the new geofence.

3. Update an Existing Geofence Area:

- In the Geofence Areas listing, **click on the Geofence area card** you wish to edit.
- A popup will appear displaying the geofence details.
- Locate and click the **three dots option** (**...**).
- Select the **"Edit"** button.
- Modify the details as needed (e.g., address, speed limit, boundary points).
- Click **"Save"** or **"Update"** to confirm your changes.

4. Delete a Geofence Area:

- In the Geofence Areas listing, **click on the Geofence area card** you want to remove.
- A popup will appear displaying the geofence details.
- Locate and click the **three dots option** (**...**).
- Select the **"Delete"** button.
- Confirm your decision if prompted.

Key Features You'll Use

- **Add Geofence:** Easily create new virtual boundaries with specific details like name, address, and speed limits. You can choose different shapes:
 - **Circular Geofence:** Define a circular area by setting a central point and a radius.
 - **Rectangle Geofence:** Create a rectangular zone by defining its corners.
 - **Polygon Geofence:** Design complex, multi-sided areas using multiple coordinate points.

- **Update Geofence:** Modify existing geofence details or adjust their boundaries as your operational needs change.
- **Remove Geofence:** Delete obsolete or unused geofence areas from the system.
- **Search and Filter:** Quickly find specific geofences by:
 - **Location Name:** Search by the name you assigned to the geofence.
 - **Latitude/Longitude:** Find geofences using exact geographical coordinates.
 - **Address:** Search by street address.
- **Map Interaction:**
 - **View Geofence:** Display the details and boundaries of any added geofence on the map.
 - **Zoom In/Out:** Adjust the map view to see a wider area or focus on specific details of your geofences.
 - **Update Location Marker:** Precisely adjust the location marker on the map for fine-tuning your geofence placement.
- **Data Export:** Download geofence data in various formats, such as **PDF** or **Excel**, for reporting or offline analysis.
- **Records Per Page:** Customize how many geofence records are displayed on a single page for easier browsing.
- **Mobile Responsiveness:** Manage geofences on the go, as the system and "Add Geofence" button are designed to work seamlessly on all screen sizes and mobile browsers.
- **Cross-Browser Compatibility:** The application's user interface and map elements will render consistently and correctly across different web browsers (Chrome, Firefox, Edge).

Common Scenarios

- **Setting Up a Delivery Zone:** Create a polygon geofence around a specific neighborhood or industrial park. When a delivery vehicle enters this zone, the system can automatically send a notification to the customer that their delivery is nearby.
- **Monitoring a Trip:** Define a Trip Geofence along a specific route between two cities. This allows you to monitor if a vehicle deviates from the planned route or enters any restricted areas along the way.
- **Warehouse Entry/Exit Tracking:** Set up a geofence around your warehouse. You'll receive alerts every time a vehicle enters or exits, helping you track arrival and departure times for logistics and security.
- **Enforcing Speed Limits:** Assign a specific speed limit to a geofence area. If a vehicle exceeds this limit while inside the geofence, an alert can be triggered, helping to promote safer driving.
- **Reporting on Vehicle Activity:** Export a list of all your geofence areas and their associated details to an Excel file for comprehensive reporting on past vehicle movements and compliance.
- **Reviewing a Geofence:** Navigate to the Geofence Areas list, click on a geofence, and use the "View" option on the map to review its boundaries and ensure it covers the intended area.

What to Expect

After performing various actions within the Geofence Areas module, you can expect the following outcomes:

- **Adding a Geofence:** The new geofence should be successfully created and immediately displayed on the map within 2-3 seconds, with a confirmation success message.
- **Updating a Geofence:** The geofence area will reflect the new information you provided, and its details on the map will be updated accordingly. The location marker will change if updated.
- **Deleting a Geofence:** The selected geofence area will be successfully removed from the system and will no longer appear on the map or in the list.
- **Searching Geofences:** Based on your search criteria (location name, latitude, longitude, or address), the system will display the corresponding geofence areas on the map.

- **Map Interaction:** When you zoom in or out, the geofence areas will adjust in size on the map, becoming larger or smaller as expected.
- **Exporting Data:** A file in your chosen format (PDF or Excel) will be downloaded, containing all the geofence details.
- **System Responsiveness:** The UI will adjust to different screen sizes (mobile, tablet, desktop) and render correctly across various browsers, ensuring a consistent user experience.
- **Automated Untracking:** Vehicle events that are no longer needed will be automatically untracked by the system's background process, keeping your geofence data current and efficient.

Business Rules & Constraints

The Geofence Areas module incorporates automated background processes and specific rules to ensure smooth and efficient operation:

- **Backend Processing Time:** When you add a new geofence, the system typically processes and displays it within **2-3 seconds**. For displaying a large number of geofences (e.g., 100+), the system is optimized to load them within **3 seconds** for optimal performance. Delays can occur due to slow internet, large dataset size, or server performance issues. To improve speed, try clearing your cache, using a faster connection, or enabling map clustering.
- **Vehicle Event Untrack Cron:** This is an automated background process (a "cron job") that runs regularly to keep your vehicle event data clean and relevant.
 - **Purpose:** It automatically scans the system for tracked vehicle events and untracks them based on predefined rules. This means events that are no longer active or relevant will be marked inactive or deleted.
 - **Handling Active Events:** Only **active or currently tracked** vehicle events are processed and untracked. Inactive or already removed events are ignored.
 - **Manual Trigger (Admin Only):** While automated, authorized administrators can manually trigger this cron job via the admin console or API if needed. Unauthorized users will be denied access.
 - **Data Integrity:** If the cron encounters invalid or corrupted event data, it will log the error details and skip those specific events, ensuring other events continue to be processed without interruption.
 - **System Integration:** The cron job automatically syncs with the Geofence module to update data and integrates with the database cleanup system to ensure untracked events are marked inactive or deleted. It also notifies external systems (like analytics or reports) to update their records.
 - **Performance:** It's optimized to efficiently handle thousands of vehicle events, maintaining stable performance even under heavy system load without timeouts or failures.
 - **Rule Adaptability:** The cron job always follows the latest untracking logic and rules set by the administrator.
- **Geofence Drawing Limitations:** While you can define various shapes, very complex or highly detailed polygon geofences might take slightly longer to process due to the number of coordinates involved. Using simpler shapes can improve processing time.
- **Permissions:** You must have the appropriate user permissions to add, edit, or delete geofence areas. Unauthorized access to critical functions like manual cron triggering or log access is blocked.

4. Visual Elements & Supporting Information

Geofence Areas Display & Search

This page allows you to view existing geofence areas, search for specific ones, and initiate the creation of new geofences. It provides an overview of your configured virtual boundaries.

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Location Name

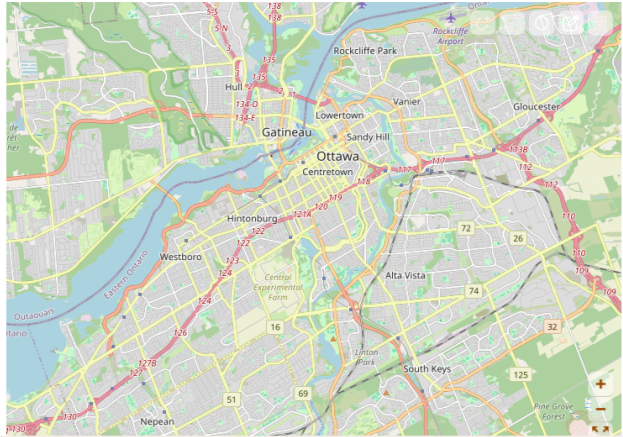
Latitude, Longitude

Address

+ Add Geofence

Sync Geofence

Export



Geofence Areas

Location Name

Address

Pune

Test1234

Address

Vishrantwadi, Kalas...

Vishrantwadi, Kalas...

Location Name

Address

Pune

Test1234

Address

Vishrantwadi, Kalas...

Vishrantwadi, Kalas...

Location Name

Address

Pune

Test1234

Address

Vishrantwadi, Kalas...

Vishrantwadi, Kalas...

Location Name

Address

Pune

Test1234

Address

Vishrantwadi, Kalas...

Vishrantwadi, Kalas...

Location Name

Address

Field Validation Table (for Search/Filter Options)

Field Name	Mandatory	Field Type	Data Type	Field Size	Is Editable	Description
Location Name	No	Text	String	N/A	Yes	Search for geofences by their assigned name.
Latitude	No	Text	Number	N/A	Yes	Search for geofences using latitude coordinates.
Longitude	No	Text	Number	N/A	Yes	Search for geofences using longitude coordinates.
Address	No	Text	String	N/A	Yes	Search for geofences by their physical address.

Add New Geofence Area

Use this form to define and create new geofence areas in your system. You'll input key details and define the area on the map.

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Add Geofence

Parent Area

Select Area...

Geofence Areas *

Enter Location Address

Address *

Enter Address

Landmark

Enter Landmark ...

City / State *

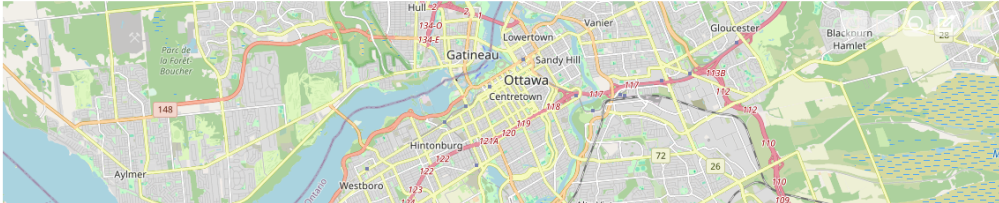
Enter City / State...

Country

Select Country...

Area Speed Limit *

Select Speed Limit...



Field Validation Table

Field Name	Mandatory	Field Type	Data Type	Field Size	Is Editable	Description
Parent Area	Yes	Dropdown	String	N/A	Yes	Select the larger geographical region or parent group for this geofence.
Geofence Area Name	Yes	Text	String	Max 100	Yes	A unique and descriptive name for your new geofence area.
Address	Yes	Text	String	Max 255	Yes	The primary street address associated with the geofence area.
Landmark	No	Text	String	Max 255	Yes	A notable feature or building near the geofence for easier identification.
City/State	Yes	Text	String	Max 100	Yes	The city and state where the geofence is located.
Country	Yes	Text	String	Max 100	Yes	The country where the geofence is located.
Area Speed Limit	Yes	Number	Number	Max 3	Yes	The maximum allowed speed (in km/h or mph) within this geofence area.
Geofence Map Drawing	Yes	Map Drawing	GeoJson	N/A	Yes	Tools to draw the geofence shape (circle, rectangle, polygon) on the map.

Update Geofence Area Details

This page allows you to modify the details of an existing geofence area, ensuring your virtual boundaries remain accurate and relevant.

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Parent Area

Select Area...

Address *

Enter Address

City / State *

Enter City / State...

Area Speed Limit *

Select Speed Limit...

Geofence Areas *

Enter Location Address

Landmark

Enter Landmark ...

Country

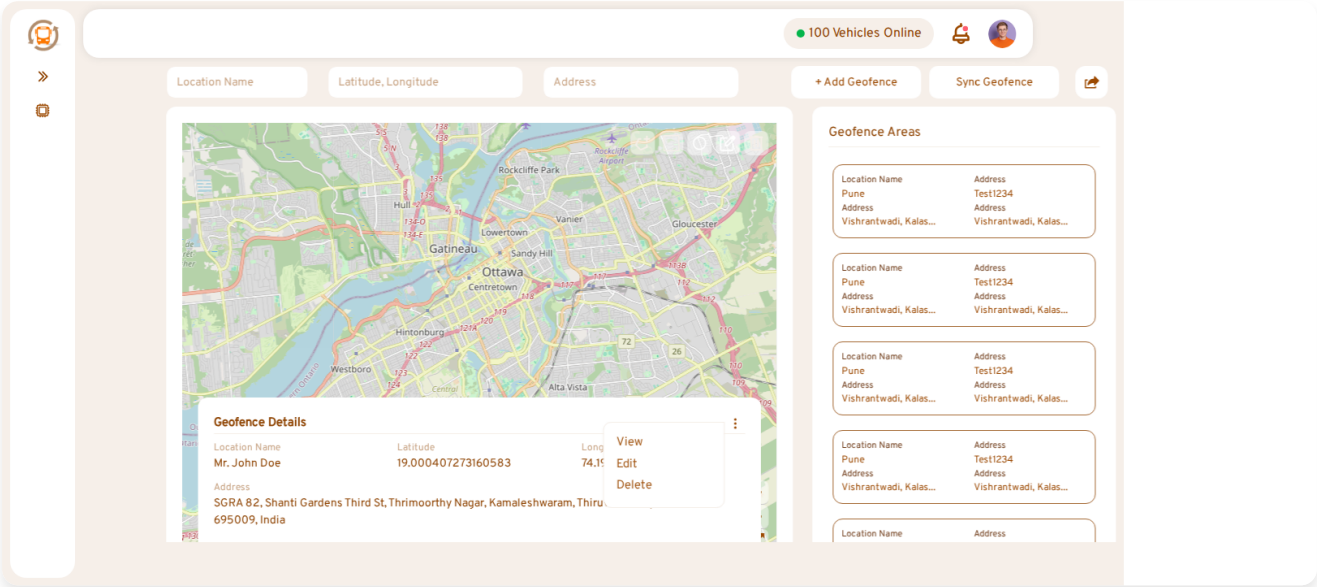
Select Country...

Field Validation Table

Field Name	Mandatory	Field Type	Data Type	Field Size	Is Editable	Description
Parent Area	Yes	Dropdown	String	N/A	Yes	Update the larger geographical region or parent group for this geofence.
Geofence Area Name	Yes	Text	String	Max 100	Yes	Update the unique name for the geofence area.
Address	Yes	Text	String	Max 255	Yes	Update the primary street address associated with the geofence area.
Landmark	No	Text	String	Max 255	Yes	Update a notable feature or building near the geofence.
City/State	Yes	Text	String	Max 100	Yes	Update the city and state where the geofence is located.
Country	Yes	Text	String	Max 100	Yes	Update the country where the geofence is located.
Area Speed Limit	Yes	Number	Number	Max 3	Yes	Update the maximum allowed speed (in km/h or mph) within this geofence.
Geofence Map Drawing	Yes	Map Drawing	GeoJson	N/A	Yes	Tools to adjust the geofence shape (circle, rectangle, polygon) on the map.

Remove Geofence Area Confirmation

This page is displayed when you initiate the deletion of a geofence area, allowing you to review the details before confirming the removal.



(No input forms or fields are present on this page, as it is a confirmation view for deletion. It typically displays details of the item to be deleted and a confirmation button.)

5. Summary & Benefits

Geofence Areas empowers you with a robust, intuitive tool for managing your vehicle movements within defined geographic zones. By offering easy-to-use features for creating, updating, and monitoring virtual boundaries, this module transforms complex tracking needs into simple, automated actions.

You gain the immediate benefit of improved security through instant alerts, streamlined operations with automated tracking, and greater peace of mind knowing your assets are where they should be, adhering to your rules. Whether it's optimizing delivery routes, ensuring compliance with restricted zones, or simply enhancing oversight, Geofence Areas provides the foundational intelligence you need to make smarter, faster decisions for your business.