MIZORAM PWD MOVEABLE ASSET TRACKING SYSTEM

TERMS OF REFERENCE

SECTION 1: INTRODUCTION

1.1 Overview

With its vision to meet the states need for the provision and management of the state roads network and building infrastructure to the best standards within the strategy policy framework set by the Government of Mizoram and thus promote economic well-being and quality of life of the people, PWD has a large pool of assets such as roads, bridges, buildings and movable assets(tipper, trucks, road-rollers, JCB excavator/loader) to adhere its vision.

PWD has been maintaining and utilizing its movable assets for various projects in the construction of roads, buildings, bridges and any other projects that the department undertakes. These assets are the prerequisites for execution of its projects. The expenditure for maintenance of its assets can rise extremely high due to uncontrolled utilization. To maximize the efficiency of these assets, the department needs a system that enables the department to easily supervise the status of each and every asset.

With the advancement in technologies, several solutions have been implemented by organizations world-wide to track movable assets. With the unique landscape and steep slopes of Mizoram, the solution to track the assets needs to be designed while considering the landscape of the state. To track assets even at the most remote and isolated sites, PWD needs a robust system to determine the location of its assets at any given time and for how long it has been utilized.

A GPS tracking unit is a device that uses the Global Positioning System to determine the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location data base, or internet-connected computer, using a cellular (GPRS), radio, or satellite modem embedded in the unit. This allows the asset's location to be displayed against a map backdrop either in real-time or when analysing the track later, using customized software. A GPS tracking system uses the GNSS (Global Navigation Satellite System) network. This network incorporates a range of satellites that use microwave signals which are transmitted to GPS devices to give information on location, vehicle speed, time and direction. So, a GPS tracking system can potentially give both real-time and historic navigation data on any kind of movement.

Implementing an asset tracking system based on GPS technology will provide a robust and accurate tracking system for the department. GPS will be most feasible in areas where routes of the assets and sites where the assets are utilized runs through deep slopes and high mountains.

1.2 Goals

The proposed solution will be a GPS based Asset Tracking System for tracking and monitoring all the movable assets of the department. Each asset will be equipped with a GIS module that will send accurate GIS location information to the backend system. This will help the concerned officials to track and monitor all the assets in real-time. This system will enable monitoring of assets even in remote areas.

Monitoring the movement and capturing the location of the assets will reduce the maintenance costs of the assets by eliminating unauthorized usage and fraudulent purchases. Moreover, monitoring the movement will significantly cut idle times during working hour thereby increasing the efficiency of the assets.

Tracking and monitoring the assets also improve security, prevent theft and help in recovery of stolen assets. Directing law enforcement to the last known location may help in a quick recovery of stolen vehicles and the expensive assets.

Figure 1: Asset Tracking System

1.3 Objectives

The primary objective of this project is to track and monitor the movement and location of assets owned and maintained by the department, below are some of the specific objectives of the project:

- Enable GPS enabled real-time tracking and monitoring through mobile application.
- Generate accurate reports on past service, mileage, engine hours and idle time of each asset.
- Provide comprehensive web enabled Dashboard for decision support system
- Set perimeter alarm for each asset to know when the asset enters and leaves the construction sites.
- To enable asset evaluation based on efficiency parameters such as fuel consumed, distance covered, maximum speed etc.

1.4 Expected Outcome

- Increased efficiency of assets.
- Prevent fraudulent usage of assets and fuel consumption.
- Ease of maintenance of assets.
- Reduced costs of maintenance of assets.
- Increased asset security.
- Ease of forecasting asset requirement for upcoming projects.
- Ease in identification of unassigned assets for projects.

SECTION 2: PROPOSED SOLUTION
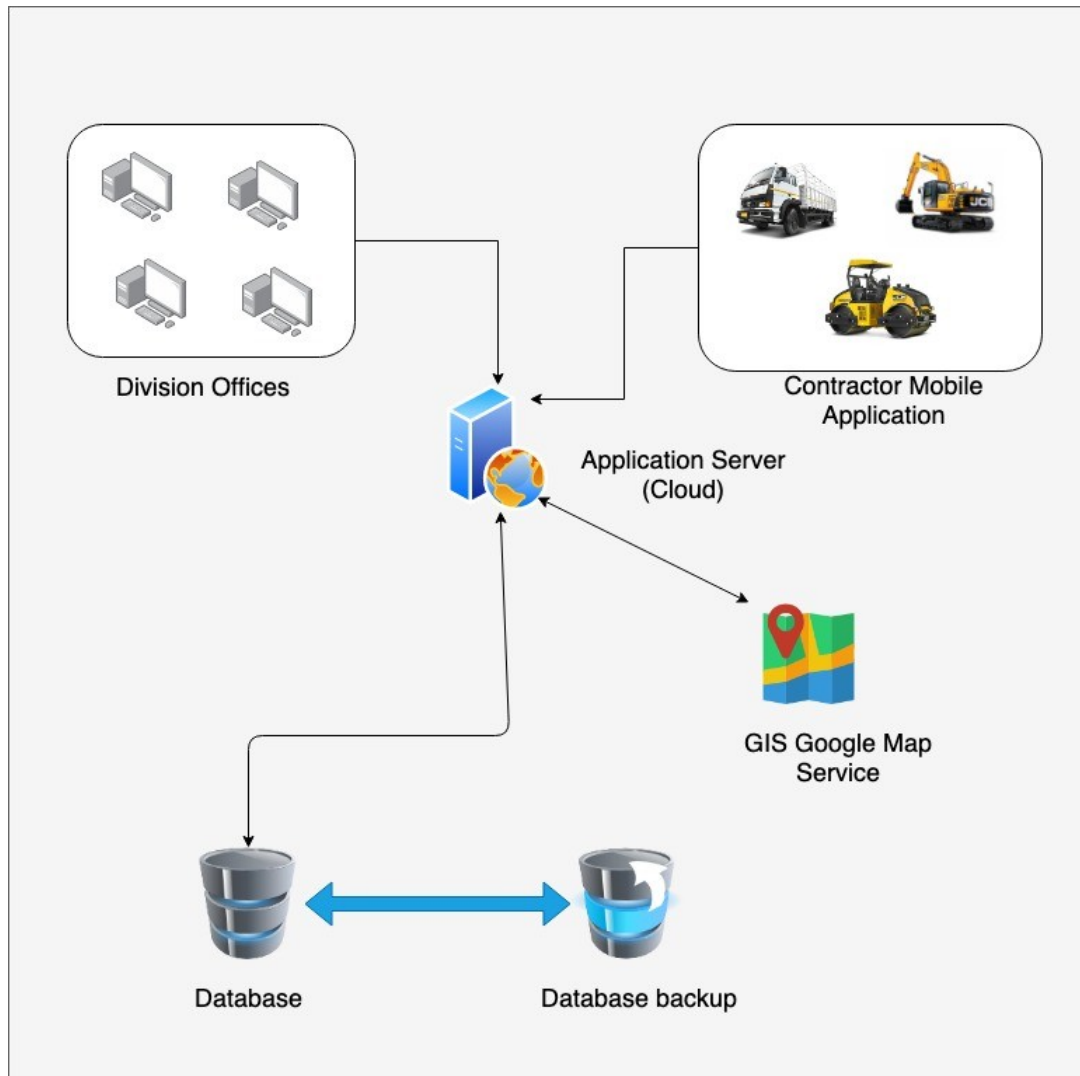
2.1 Solution Architecture

Figure 2: Solution Architecture

2.2 Application Server

An application server in a GIS environment especially in web GIS applications is software which provides customized software applications with services like query system, GIS analysis and processing, report generation, data security and authorizations etc. Many times the application servers are a part of GIS/map server. In general the web GIS application servers are customized by using API (Application Programing Interface like OpenLayer), GIS Objects and spatial libraries (eg. GDAL, OGR, Geo-tool etc).

1	Platform	PHP (Open Source Language)
2	Server	Web Service cloud based virtual server (Location India), 8 Core processor, 16 GB RAM
3	Hosting Environment	CentOS 7 (Open Source Linux)
4	Storage	160 GB SSD Hard Disk
5	Bandwidth	6TB

Table 1: Application Server Configuration/Specification

2.4 Database Server

The database server may have a file based system or Relational Database Management System (RDBMS) based or a combination of files and RDBMS. In a typical web GIS application the spatial data is organized in RDBMS environment which allows better performance, data security, data consistency and many more advantages of RDBMS of GIS data sets.

1	Platform	PostgreSQL
2	Server	Web Service cloud based virtual server (Location India), 8 Core processor, 16 GB RAM
3	Hosting Environment	CentOS 7 (Open Source Linux)
4	Storage	160 GB SSD Hard Disk
5	Bandwidth	6TB

Table 2: Database Server Configuration/Specification

2.5 Map Service

GIS Map server is a software package or program, which is responsible for rendering the GIS data into web browser. Since the standard web servers and browsers supports only standard image and data formats like .jpeg, .gif, .txt, .html, .xml, etc. To represent or publish geo-spatial data in web compatible format there is a need of intermediate software components called as GIS Map server. In this project it is proposed to use Google Map Service for GIS mapping.

2.6 Application Software Modules

1. **Information Module**: This module will collect and record detailed information of each asset.

2. **Report Dashboard Module**: This module provides comprehensive information of all the assets near real- time. Reports may be downloaded in spreadsheet and pdf format anytime.

3. **Role-based Access Control Management**: The software will have different access privileges for different level of users. This will ensure different layers of users to access different parts of the dotware thereby enforcing a clear-defined hierarchy of authority

4. **GIS Dashboard**: Different kinds of GIS reports of a particular asset can be generated using this software. This module will provide graphical reporting system with the help of GIS map. Map-based reporting system provide visual guide for decision makers for better and faster decisions. Asset abstract, monthly asset status, consolidated asset reports etc. are included in this module. Asset report may be viewed and analysed by using GIS tools

5. **Asset Maintenance Module**: This module will capture all the expenses and the type and maintenance given to the asset. The information captured by this module will be used to generate the efficiency report of a particular asset.

6. **Perimeter Logger**: This module will log the entry and exit of an asset on site perimeter which will be based on geo-fencing. This module will assign an asset to a construction site

7. **Asset Monitoring Module**: This module will display the real-time location and status of assets.

2.7 Scope of Work

The scope of work includes the following:

i)   Supply and Installation of GPS devices on 250 nos of movable assets under PWD.

ii)   Development and Implementation of Asset Tracking System with the following features.

- Information Module: This module will collect and record detailed information of each asset.

- Report Dashboard Module: This module provides comprehensive information of all the assets near real-time. Reports may be downloaded in spreadsheet and pdf format anytime.

- Role-based Access Control Management: The software will have different access privileges for different level of users. This will ensure different layers of users to access different parts of the software thereby enforcing a clear-defined hierarchy of authority

- GIS Dashboard: Different kinds of GIS reports of a particular asset can be generated using this software. This module will provide graphical reporting system with the help of GIS map. Map-based reporting system provide visual guide for decision makers for better and faster decisions. Asset abstract, monthly asset status, consolidated asset reports etc. are included in this module. Asset report may be viewed and analyzed by using GIS tools

- Perimeter Logger: This module will log the entry and exit of an asset on site perimeter which will be based on geo-fencing. This module will assign an asset to a construction site

- Asset Monitoring Module: This module will display the real-time location and status of assets.

- Cloud hosting of the application server, database server with PostgreSQL server including PostGIS, mp service and back-up server for 5 (five) years.

iii) Capacity Building and Training

2.5 Duration of work

A total of 4 (four) months is estimated for complete installation of the smart attendance system. Expected completion phases are as follows:

- Phase I : Verification of the moveable asset recorded by PWD and installation of the GPS devices – 1.5 months

- Phase II : Software Integration – 2nd months

- Phase III : Training for usage of software – 3rd months.

- Phase IV : Commissioning and maintenance – 6th months.

2.6 Reporting Requirements.

- Phase I : Progress report to be submitted on the end of 2nd month and on acceptance of the report 30% of the contract Agreement will be paid

- Phase II : On successful commissioning of the software, progress report is to be submitted and on acceptance of the report 30% of the contract amount will be released.

- Phase III : Report on completion of training for usage of the system will be submitted by the end of the 3rd month and 20% of the contract amount will be released.

- Phase IV : At the end of 6th month on successful commissioning of the system, issue of the completion certificate by the client and commitment letter in a stamp paper for un-interrupted hosting of the system on cloud storage by the consultant, 20% of the contract amount will be released.