GIS-Based Delivery Workflow for Incorporating DIGIPIN/Digital Address into India Post Mail Booking, Sorting, and Delivery

1. Introduction

The integration of DIGIPIN and Digital Address into India Post's operations marks a groundbreaking initiative to modernize and streamline the processes of mail booking, sorting, and delivery. This approach aims to leverage Geographic Information System (GIS) technologies and digital address systems to create an efficient, scalable, and technology-driven postal ecosystem. The new system addresses existing challenges in postal logistics while ensuring accuracy, reliability, and real-time tracking. This document outlines the envisioned workflows and features required to transition to a GIS-based delivery infrastructure and highlights the necessary validations and quality control measures.

2. Booking Workflow

a) Booking Portal/Counter Integration:

At the time of booking, the sender provides a DIGIPIN or Digital Address. For DIGIPIN, the system retrieves geolocation data automatically and assigns the appropriate delivery post office based on pre-defined geo-fenced PIN codes. For Digital Address, the system fetches the complete address details linked to the digital address from the Address Information Provider (AIP) server, auto-filling recipient data for convenience. This minimizes errors, reduces manual input, and ensures standardization of address formats.

b) Dynamic QR Code Generation:

A dynamic QR code is generated for each mail article. This code embeds key data such as the DIGIPIN, and recipient address. It also serves as a scannable identifier for tracking and sorting purposes. The QR code is printed and attached to the article, enabling seamless processing through automated systems.

c) Validation:

The system validates the provided address PIN code information against the geographic coordinates of the DIGIPIN/Digital Address based on the geofenced pin code geojson layer. Inconsistencies trigger alerts for manual review, ensuring accuracy and compatibility with the GIS framework.

3. Sorting Workflow

a) Automatic Sorting Machines (ASM)/System-Assisted Sorting:

The QR codes on mail articles are scanned by Automatic Sorting Machines (ASM) or handheld scanners, which categorize articles based on DIGIPIN and their geo-fenced PIN code information. This step eliminates manual errors, accelerates sorting, and optimizes workflows, preparing articles for dispatch based on their destination.

b) Dispatch to Post Offices:

Once sorted, the articles are grouped and dispatched to destination post offices.

4. Delivery Workflow

The delivery workflow requires a robust GIS platform integrated with India Post's backend systems, offering functionalities like real-time route optimization, geo-validations, and a GNSS-enabled mobile app for postman. Below are the detailed features and functionalities required:

a) Dynamic Beats:

Upon receiving articles at the delivery hub, the system dynamically allocates delivery beats to postmen. Instead of fixed jurisdictions, articles are algorithmically assigned based on optimized routes, enabling workload balancing and flexible resource allocation. This improves productivity and adaptability to demand fluctuations.

b) Route Optimization Using GIS:

The GIS-enabled mobile application generates optimized routes for delivery personnel, considering factors such as traffic conditions, road closures. Routes are adjusted dynamically based on real-time data, ensuring maximum efficiency and reducing fuel costs.

c) Navigation Using the GIS Mobile Application:

The mobile application provides turn-by-turn navigation for postmen, guiding them to each delivery location. The integration of GNSS technology ensures precise tracking and location accuracy, helping delivery personnel navigate even in remote areas or dense urban clusters.

d) Geofencing - Threshold Validation:

Geofencing ensures that postmen can mark an article as delivered only when they are within a predefined threshold around the delivery location. This validation prevents mis deliveries and provides confidence in location-specific deliveries. Exceptions are flagged for manual intervention, ensuring quality control.

e) Delivery Updates:

Real-time updates on delivery status are captured and shared through the mobile app. The recipient provides confirmation via digital signature, OTP, or biometric verification, creating a secure and tamper-proof delivery record.

f) Proof of Delivery (POD):

The GIS system logs delivery coordinates and timestamps, creating immutable proof of service for each article. This data can be accessed for dispute resolution, compliance checks, and performance evaluation.

g) Monitoring and Reporting:

Supervisors monitor deliveries in real time through dashboards that track delivery status, delays, and deviations. Performance metrics such as delivery success rates and route efficiency are analyzed for process optimization. Failed deliveries are geo-tagged, enabling root cause analysis and corrective actions.

h) Workflow Enhancements:

Automated alerts are generated for undeliverable or incorrectly addressed articles, enabling timely intervention. Algorithms dynamically adjust routes in response to emergencies or diversions, ensuring resilience and adaptability during disruptions.

i) GIS based pickup

The GIS system accommodates enabling automated allocation of resources to attend pickup requests and GIS based pickup facility similar to the GIS based delivery.