

HANEYA Routing Optimization Solution

Automatic Network Creator (ANC)

White Paper

1. Executive Summary

HANEYA Routing Optimization is an enterprise GIS automation solution designed for logistics and distribution use cases. The solution includes **Automatic Network Creator (ANC)**, which automates the full lifecycle required to deliver routing capabilities - starting from **data extraction**, then **network dataset and locator creation**, and finally **publishing and maintaining ArcGIS Enterprise services** such as **Route, Closest Facility (CF), and VRP**.

Instead of treating routing services as “one-time deployments,” the solution operationalizes them as a repeatable pipeline that can be run whenever maps, restrictions, plants / depots, or publishing environments change, while maintaining traceability via run history, statuses, and logs.

2. Problem Statement & Challenges

In enterprise logistics environments, routing services must be refreshed frequently due to continuous operational changes such as:

- New map versions arriving
- Street / restriction updates
- New plants / depots being added
- Locator input updates
- Publishing environment changes

Without automation, maintaining these services becomes manual and error-prone, especially when scaling across many plants / depots. ANC exists to remove that operational burden by standardizing and automating the workflow from extraction through publishing in a consistent, repeatable way.

3. Solution Overview

ANC provides a structured automation pipeline that turns a complex ArcGIS operational workflow into a streamlined and repeatable process. At a high level:

- **Operator triggers a run** via UI
- A central **Manager** orchestrates the workflow
- Dedicated services execute each step (extraction, network, locator, publishing, tracking)
- Repositories update operational databases
- ArcGIS ArcPy performs GIS operations and publishes final services

This layered approach makes the solution easier to maintain, extend, and operate.

4. Target Use Cases

HANEYA Routing Optimization supports foundational logistics / distribution capabilities published as ArcGIS services:

- **Locator / Geocode:** Converts an address into latitude & longitude for delivery points, depots, and stops.
- **Route:** Generates turn-by-turn routes and returns directions, travel time, distance, and maneuvers.
- **Closest Facility (CF):** Enables “nearest depot / service center” and dispatch scenarios (e.g., nearest truck assignment).
- **VRP (Vehicle Routing Problem):** Multi-stop, multi-vehicle optimization to minimize cost/time under constraints like time windows and capacity rules.

5. Key Capabilities

A) End-to-end GIS automation

ANC automates the complete workflow from extraction to publishing, consistently and repeatably.

B) Standardized pipeline across plants/depots

ANC standardizes execution steps so operations teams can run the same process across many plants / depots with consistent outcomes.

C) Operational visibility and auditability

ANC tracks process state, statuses, and logs in a relational database to support visibility and audit requirements.

D) Published services that external systems can consume

Services are available via REST endpoints and can be consumed by web apps, mobile driver apps, ERP integrations, and planning systems.

6. Architecture Overview

ANC follows a **layered architecture** built for maintainability and extensibility.

UI Layer (Operator Experience)

Operators trigger runs, select plants, and monitor status via the UI. The UI communicates to the backend through an API layer.

Orchestration Layer (Manager/Controller)

A central **Manager** coordinates the workflow and calls individual services for each step.

Service Layer (Pipeline Execution)

ANC executes the workflow using dedicated services:

- Extraction Service (pull/prepare datasets)
- Network Service (build/update network dataset)
- Location Calculation Service (where required)
- Locator Service (generate locators)
- Publishing Service (publish/update ArcGIS services)
- Processing / Tracking Service (consistent run state + auditability)

Data Layer (Operational + GIS artifacts separation)

- Relational database (e.g., SQL Server): process tables, run history, statuses
- ArcGIS geodatabase: feature classes, network datasets, locator artifacts
This separation keeps operational tracking in SQL while GIS artifacts remain in the geodatabase.

Configuration Model

Settings include map versions, plant settings, and environment settings enabling flexibility without hardcoding.

Licensing Component

Before running ArcPy operations, the system validates and checks out licenses to prevent failures mid-pipeline.

7. User Experience & Operations (ANC UI)

ANC UI lets operators run and manage the pipeline without manually executing ArcGIS steps.

Connection & Access

Connect using Base URL + API key and load the latest process status.

Admin Tab

- Map Version: Select and confirm the map version. Plants tab runs use the confirmed version.
- NDS Buffer: edit the NDS buffer size.

Plants Tab

- Create per plant: each plant row has a Create button to trigger execution for that plant.
- PlantProcess tracking: shows plant, environment, run number, run GUID, and step statuses (NDS, location, locator, services).
- Refresh: reload latest status from the database.

Resume from Failure / Pause

Continue from the last failed/paused step instead of restarting from the beginning.

Job Visibility & Logs

View job status (job ID/state/timestamps) and logs for failures (license, DB, ArcPy, publishing).

Operational Controls

- Cancel / Delete for run management.
- Dead Plants Cleanup to remove data / artifacts for inactive plants / depots.

8. Integration & Consumption

The published ArcGIS services are exposed via **standard REST endpoints**, allowing external systems to consume them easily, including:

- Web applications
- Mobile driver applications
- ERP integrations
- Planning systems

These services accept inputs such as stops, barriers, travel mode, and parameters, then return structured JSON outputs for downstream usage.

9. Reliability, Monitoring & Auditability

ANC is designed to be operationally reliable through:

- A **Processing / Tracking Service** that keeps run state consistent and auditable.
- Database-driven tracking of **run history, statuses, and logs**, enabling visibility and audit trails.
- UI-driven monitoring where operators can see run GUID updates and component statuses without checking multiple systems.
- Log-based troubleshooting that pinpoints failures across licensing, DB fetch, ArcPy execution, or publishing.

10. Performance & Scalability

ANC is built specifically for enterprise scale where many plants/depots must be supported and refreshed repeatedly. Without automation, this becomes manual and error-prone “especially when you scale across many plants or depots,” so ANC’s standardized pipeline addresses scalability through repeatability and operational control.

Scalability is further supported by:

- Configuration-driven execution (map versions, plant/environment settings), reducing hardcoding and enabling broader rollout.
- Central orchestration (Manager + services) which allows consistent execution across plants.

11. Business Value & ROI

The business value of HANEYA Routing Optimization comes from enabling and maintaining foundational logistics capabilities while minimizing operational burden:

A) Always-available routing services for logistics

Publishing and maintaining Locator, Route, Closest Facility, and VRP services enables core workflows like dispatching, nearest facility resolution, and optimized multi-vehicle routing.

B) Reduced manual effort and fewer errors

Because services require frequent refresh cycles, ANC avoids a manual, error-prone maintenance model by automating extraction → build → publish end-to-end.

C) Faster time-to-update when business changes

When map versions, restrictions, plants / depots, or publishing environments change, ANC provides a repeatable run process rather than re-building steps manually.

D) Audit-ready operations and easier troubleshooting

Run status, run GUID tracking, and logs provide visibility and traceability for operations teams and stakeholders.