WESTERN AUSTRALIA POLICE FORCE

Challenge Statement

The challenge is about optimising the allocation of resources and time in response to incidents.

1. Background

Numerous incidents are reported to WA Police every day, requiring timely and efficient response. Each incident has a priority level dictating the response time and specific resource capabilities needed. Different police stations have varying resources, and at any given time, some resources may be unavailable due to maintenance or deployment elsewhere. Ideally, the nearest station should respond, but this isn't always possible due to resource availability and location. Currently these resource allocations are done manually.

2. Objective

The objective of the resource allocation and emergency route optimisation challenge is to maximise the number of incidents responded by the organisation while minimising the response time and resource required while maximising the information gathered.

The challenge aims to optimise resource allocation and emergency route planning to:

- Maximise the number of incidents responded to.
- Minimise response time.
- Optimise resource usage.
- Maximise information gathered from incidents.

This requires real-time tracking of resource locations and efficient allocation based on incident priority and resource requirements.

3. Constraints

- **Limited Resources**: Different types and numbers of resources are available at a certain time at a certain location.
- **Resource Locations and Availability**: Resources may be engaged elsewhere or under maintenance.
- **Incident Type and Priority**: Priorities influence the time required for response and number of resource allocation.

- **Existing Incidents**: Ensuring resources are not depleted by ongoing incidents and can respond to new incidents timely. • Limited number of resources available by capability type at a given time

4. Potential Solution

It is a Multi-Objective Optimisation Problem

1. Algorithmic Optimisation: Develop algorithms to prioritise and allocate resources based on incident priority, resource availability, and response time optimisation.

2. Use techniques such as Linear Programming/Mixed-Integer Programming/Heuristic Algorithms to dynamically allocate resources to incidents.

5. Data

- **Number and type of capabilities available**: Details of capabilities by type and availability.
- **Dynamic locations of capabilities**: Current status of capabilities (e.g., on job, under maintenance).
- **Incident List with Location and Priority**: Details of incidents, including location and priority.
- **Road Map**: Geographical data for route planning.

6. Data Dictionary

No	Column Name	Data Type	Description
1	OBJECTID	Integer	Unique identifier for each record.
2	ROAD_NO	String	Road number associated with the location of the incident.
3	ROAD_NAME	String	Official name of the road where the incident occurred.
4	COMMON_ROAD_NAME	String	Commonly known name of the road where the incident occurred.
5	CWAY	String	Carriageway designation, indicating the specific part of the road used by vehicles.
6	SLK	Float	Straight Line Kilometre, indicating the distance from a defined starting point in kilometres.
7	INTERSECTION_NO	Integer	Unique identifier for the intersection related to the incident.
8	INTERSECTION_DESC	String	Description of the intersection where the incident occurred.
9	LONGITUDE	Float	Longitude coordinate of the incident location.
10	LATITUDE	Float	Latitude coordinate of the incident location.

11	CRASH_TIME	Time	Time indicating when the incident occurred.
12	INCIDENT TYPE	String	Category of the incident based on severity or type.
13	PRIORITY	String [["IMMEDIATE", "URGENT", "ROUTINE", "NON-URGENT"]	Priority level of the incident, indicating urgency for response. Each Priority has different response time and different number of capabilities requirement.
14	CAPABILITY 1	String	Resource required for each incident.

Participants should generate synthetic data if more data is needed for testing the algorithms.