



Low Level Design Document

Introduction

This Low Level Design (LLD) document outlines the implementation details for **MoveFlow - Transportation Fleet Dashboard**. The project aims to deliver a Tableau dashboard visualizing fleet utilization, trip frequency, maintenance schedules, and cost analysis for a transportation company.

1. System Components

Component	Description	Key Responsibilities
Data Source	Fleet, trip, and maintenance data (CSV/DB)	Store and provide raw data
Data Pipeline	ETL scripts/processes	Clean, transform, and load data to Tableau
Tableau Dashboard	Tableau workbook	Visualize metrics and calculated analytics
Calculated Fields	Tableau formulas	Perform cost and utilization calculations

2. Class/Interface Overview

Class/Interface	Description	Key Methods/Attributes
DataExtractor	Extracts raw data	<code>extract()</code>
DataTransformer	Cleans/transforms data	<code>clean()</code> , <code>transform()</code>
DataLoader	Loads data to Tableau	<code>load()</code>
TableauDashboard	Tableau workbook	Sheets: Fleet Utilization, Trip Freq., Maintenance, Cost Analysis
CalculatedField	Tableau formula	<code>name</code> , <code>formula</code>

Relationships:

- DataExtractor → DataTransformer → DataLoader → TableauDashboard
 - CalculatedField used within TableauDashboard
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3. Data Structure Overview

Model	Fields
Fleet	fleet_id, vehicle_type, status, capacity
Trip	trip_id, fleet_id, start_time, end_time, distance, cost
Maintenance	maintenance_id, fleet_id, date, type, cost



4. Algorithms/Logic

ETL Flow:

```
for each data_source in [Fleet, Trip, Maintenance]:
    data = DataExtractor.extract(data_source)
    clean_data = DataTransformer.clean(data)
    transformed_data = DataTransformer.transform(clean_data)
    DataLoader.load(transformed_data)
```

Tableau Calculated Fields (examples):

- Utilization Rate:
`SUM([Trip Distance]) / SUM([Fleet Capacity])`
- Maintenance Cost per Vehicle:
`SUM([Maintenance Cost]) / COUNTD([fleet_id])`
- Trip Frequency:
`COUNT([trip_id]) BY [fleet_id]`

5. Error Handling

Scenario	Handling Approach
Data extraction failure	Log error, alert user, skip to next file
Data validation error	Log invalid rows, continue processing
Tableau data load failure	Retry load, log error, notify admin
Calculated field error	Display default value, log issue

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