**PROJECT DOCUMENTATION**

The **Nairobi, Kenya PSV (Public Service Vehicle) network** — it’s a unique and vibrant part of the city's transportation system

**🚐 Matatus – The Heart of the Network**

* **Matatus** are the primary mode of public transport in Nairobi.
* These are privately owned minibuses, typically 14-seaters or 33-seaters.
* Each route is usually served by several matatus that are part of a **SACCO** (Savings and Credit Co-operative Organization), which helps regulate operations (in theory).
* Matatus are famous for their colorful graffiti-style art, flashy lights, booming sound systems, and themed interiors — often showcasing music icons, local celebs, or pop culture.

**📍 Routes & Termini**

* Nairobi's matatu network radiates from the **CBD (Central Business District)**.
* Major termini include:
  + **Kencom Stage** – central for many city-bound routes.
  + **Railways**, **Ambassadeur**, **Tuskys OTC**, **Bus Station**, **Koja Stage**, etc.
* Each matatu route is assigned a **route number**, like 23, 46, 105, etc, for example:
  + **Route 23**: CBD to South B
  + **Route 46**: CBD to Kawangware
  + **Route 105**: CBD to Ongata Rongai (known for the wildest matatus)

**💳 Fares & Payment**

* Fares vary by distance, time of day, and even weather (rain = surge pricing).
* Cash is most common, though some attempts (like BebaPay and cashless cards) have been made to modernize payments — with mixed success.

**🚦Challenges**

* Traffic congestion is a big issue, especially during peak hours.
* Matatus can be erratic — some don’t follow strict schedules.
* Regulation is often lax, leading to concerns about safety, reckless driving, and overloading.
* There's competition between SACCOs, sometimes leading to "crew wars" or aggressive driving.

**🌍 Digital Mapping & Innovations**

* Apps like **Ma3Route** and **Google Maps** help users navigate the system better.
* Some startups and open data projects have tried to map Nairobi's matatu network in a more structured way (like the **Digital Matatus Project**).

**THE DIGITAL MATATUS PROJECT**

**Digital Matatus Project** data is open and was designed *specifically* to be reused, remixed, and leveraged for new innovations.

**📦 What’s in the Digital Matatus Project data?**

The project created a standardized **GTFS (General Transit Feed Specification)** dataset for Nairobi’s matatu network. This includes:

* routes.txt — All matatu routes with IDs and names
* stops.txt — Locations (lat/lng) of each stop
* trips.txt — Trips (which route + stop sequence + service)
* stop\_times.txt — Timing between stops
* shapes.txt — GPS coordinates that visually map the route shape
* calendar.txt — Service availability by day

This GTFS format is the same format used by Google Maps, Moovit, etc. to display transit data.

**🔧 Ways To Leverage It**

Here are a previously proposed ideas that could remix the data:

**1. Transit App / Route Planner**

* Build a mobile or web app that helps users find the best matatu routes between two locations.
* Add filters: fastest, cheapest, least walking, most scenic, etc.
* You can use map APIs like Mapbox, Google Maps, or Leaflet to overlay the routes.

**2. Route Optimization or Heatmaps**

* Use the GTFS data with visualization tools like D3.js or Kepler.gl to analyze heavily used routes or underserved areas.
* Add live user feedback via mobile surveys or SMS to keep data current.

**3. Augmented Reality Navigation for Commuters**

* Especially for tourists or new residents — an AR mobile experience showing where to stand, which matatu to board, and what to expect.

**4. Fare Estimation Tool**

* While fares fluctuate, you could build a base model for estimating average costs per route based on time of day and distance.

**5. Matatu Culture Explorer**

* Overlay routes with media — videos of matatus, interviews with crew, matatu art galleries, etc.

**6. AI-Powered Chatbot**

* An SMS or WhatsApp bot that gives directions based on user queries like:

“How do I get from Westlands to Gikambura?”

For this project, we try to leverage the data for the **Transit/Route Planner** idea.

**TRANSIT ROUTE/PLANNER PROJECT**

The goal is essentially to build a **Matatu Route Planner for Nairobi**, a tool that helps someone answer:

*“How do I get from Point A to Point B by Matatu?”*

**🧭 Overall Strategy**

**1. 🗂️ Extract a Transit Network from the GTFS**

The following data already exists:

* stops.txt → stops with coordinates
* routes.txt → route metadata
* trips.txt + stop\_times.txt → how stops are sequenced in trips (i.e., route paths)

From these, one can build:

* A **network graph**: where each **stop is a node** and **trips are paths** (edges) connecting them
* Use a pathfinding algorithm like **Dijkstra’s** or **A**\* to compute “how to get from A to B”

**2. 🗺️ Map Interface for Users**

Using **Leaflet** or **Mapbox GL JS**, it is possible to:

* Let the user **search/select** their starting point and destination
* On submission, use geocoding (reverse address → lat/lon) + your network to compute:
  + 📍 Nearest boarding stop
  + 🚍 Available matatu routes
  + 📍 Recommended alighting stop

Then display:

* Matatu route on the map (from shapes.txt)
* Popup/summary of instructions

**3. 🤖 Simple Route Suggestion Logic**

It is important to start simple:

* Nearest stop → find which route it's on
* Check where that route goes → does it pass near the destination?
* If not, suggest **connecting routes** (transfer)

Eventually, you'll want:

* A stop-to-stop graph (as a data structure)
* Optional: estimate walking distances to/from stops

**🛠 Suggested Technical Flow (MVP)**

|  |  |  |
| --- | --- | --- |
| **Step** | **Feature** | **Tech Used** |
| 1 | Map & location selector | Leaflet or Mapbox + Geocoder |
| 2 | Load GTFS data | PapaParse or pre-processed JSON |
| 3 | Nearest stop calculation | Haversine distance |
| 4 | Find matching trips/routes | JS search/filter on stop\_times.txt, trips.txt |
| 5 | Draw route using shapes.txt | Leaflet Polyline |
| 6 | Display trip plan | Text + map overlay |

**💡 Example UX Flow:**

*User opens app → types/selects “Kasarani” to “CBD” → app says:* “Walk to stop: **Kasarani Roundabout** → Take Route 23 → Alight at: **Kencom**”

**Lets understand the data first**