INTRODUCTION OF ENTITY RELATIONSHIP DIAGRAM (ERD) OF SRS

1. Aziz Bekzhanov
2. Alan Igilikov
3. Dias Gaziz
4. Karine Aripova
5. Khorlan Assylbek
6. Yestay Aikyn

Section: 6
Group: 1

1) Entity Identification

1.1 Driver
- Description: An individual who is authorized to operate a vehicle.

1.2 Vehicle
- Description: A mode of transportation that can be assigned to a driver.

1.3 Admin
- Description: The person or group responsible for the overall management and settings of the Vehicle Management System.

1.4 Maintenance Person
- Description: An individual responsible for the repair and general maintenance of the vehicles.

1.5 Fueling Person
- Description: An individual responsible for refueling the vehicles.

1.6 Task
- Description: Specific jobs or assignments given to the drivers related to the use of vehicles.

1.7 Navigation
- Description: The system used by drivers to get from one location to another.

1.8 Route
- Description: A pre-defined path that a driver follows to reach a destination.

1.9 Auction
- Description: A formal event where vehicles are put up for bidding, and potential buyers place their bids hoping to win and purchase the vehicle.

2) Relationship Identification

2.1 Driver to Vehicle
- Description: A driver is assigned to a vehicle.
2.2 Admin to Driver, Vehicle, Task
- Description: Admin manages and assigns tasks to drivers, oversees vehicles, and controls system settings.
2.3 Vehicle to Task
- Description: A vehicle may be associated with multiple tasks.
2.4 Vehicle to Maintenance Person
- Description: A vehicle might need maintenance which is taken care of by the maintenance person.
2.5 Vehicle to Fueling Person
- Description: A vehicle gets refueled by the fueling person.
2.6 Task to Route
- Description: A task may have a designated route.
2.7 Driver to Navigation
- Description: A driver uses navigation to find routes.
2.9 Admin to Auction
- Description: An admin manages and oversees the process of auctions, ensuring their proper execution and control within the Vehicle Management System.

3) Cardinality Identification

- Driver to Vehicle – One-to-One (One driver is assigned to one vehicle at a time, and one vehicle is assigned to one driver at a time)
- Admin to Driver, Vehicle, Task – One-to-Many (One admin can manage multiple drivers, vehicles, and tasks)
- Vehicle to Task – One-to-Many (One vehicle can have multiple tasks but each task is associated with one vehicle)
- Vehicle to Maintenance Person – Many-to-One (Multiple vehicles might be maintained by one maintenance person, but each vehicle is maintained by one maintenance person at a time)
- Vehicle to Fueling Person – Many-to-One (Multiple vehicles might be refueled by one fueling person, but each vehicle is refueled by one fueling person at a time)
- Task to Route – One-to-One (Each task has one route)
- Driver to Navigation – One-to-One (Each driver uses one navigation system at a time)
- Vehicle to Auction – One-to-Many (One vehicle can be part of multiple auctions over time, but each auction references one vehicle at a time).
- Driver to Auction – Many-to-Many (A driver or bidder can participate in multiple auctions, and each auction can have multiple bidders).
- Admin to Auction – One-to-Many (An admin can manage or oversee multiple auctions, but each auction is managed by one admin at a time).

4) Identify Attributes

4.1 Driver
- DriverID (INT, Primary Key)
- Name (VARCHAR(255))
- License Number (VARCHAR(50))
- Date of Birth (DATE)
- Contact Info:
  - Phone (VARCHAR(20))
  - Email (VARCHAR(100))
- Address (VARCHAR(500))
- Assigned VehicleID (INT, Foreign Key)

4.2 Vehicle
- VehicleID (INT, Primary Key)
- Vehicle Type (VARCHAR(50))
- Registration Number (VARCHAR(50))
- Model (VARCHAR(100))
- Color (VARCHAR(50))
- Fuel Type (VARCHAR(50))
- Current Mileage (INT)

4.3 Admin
- AdminID (INT, Primary Key)
- Name (VARCHAR(255))
- Contact Info:
  - Phone (VARCHAR(20))
  - Email (VARCHAR(100))
- Username (VARCHAR(50))
- Password (VARCHAR(255))

4.4 Maintenance Person
- MaintenancePersonID (INT, Primary Key)
- Name (VARCHAR(255))
- Specialization (VARCHAR(100))
- Contact Info:
  - Phone (VARCHAR(20))
  - Email (VARCHAR(100))

4.5 Fueling Person
- FuelingPersonID (INT, Primary Key)
- Name (VARCHAR(255))
- Contact Info:
  - Phone (VARCHAR(20))
  - Email (VARCHAR(100))
- Assigned Fuel Station (VARCHAR(255))

4.6 Task
- TaskID (INT, Primary Key)
- Description (TEXT)
- Start Location (VARCHAR(500))
- End Location (VARCHAR(500))
- Assigned VehicleID (INT, Foreign Key)
- Assigned DriverID (INT, Foreign Key)
- Status (ENUM('Pending', 'In-progress', 'Completed'))

4.7 Navigation
- NavigationID (INT, Primary Key)
- Current Location (VARCHAR(500))
- Destination (VARCHAR(500))
- Estimated Time of Arrival (TIME)

4.8 Route
- RouteID (INT, Primary Key)
- Start Location (VARCHAR(500))
- End Location (VARCHAR(500))
- Distance (DECIMAL(10,2))
- Estimated Travel Time (TIME)

4.9 Auction
- AuctionID (INT, Primary Key)
- VehicleID (INT, Foreign Key)
- StartDateTime (DATETIME)
- EndDateTime (DATETIME)
- StartingBid (DECIMAL(10,2))
- CurrentBid (DECIMAL(10,2))
- WinningBidderID (INT, Foreign Key referencing the Driver or a separate Bidder entity)
- AuctionStatus (ENUM('Upcoming', 'Ongoing', 'Ended'))

5) ERD Diagram

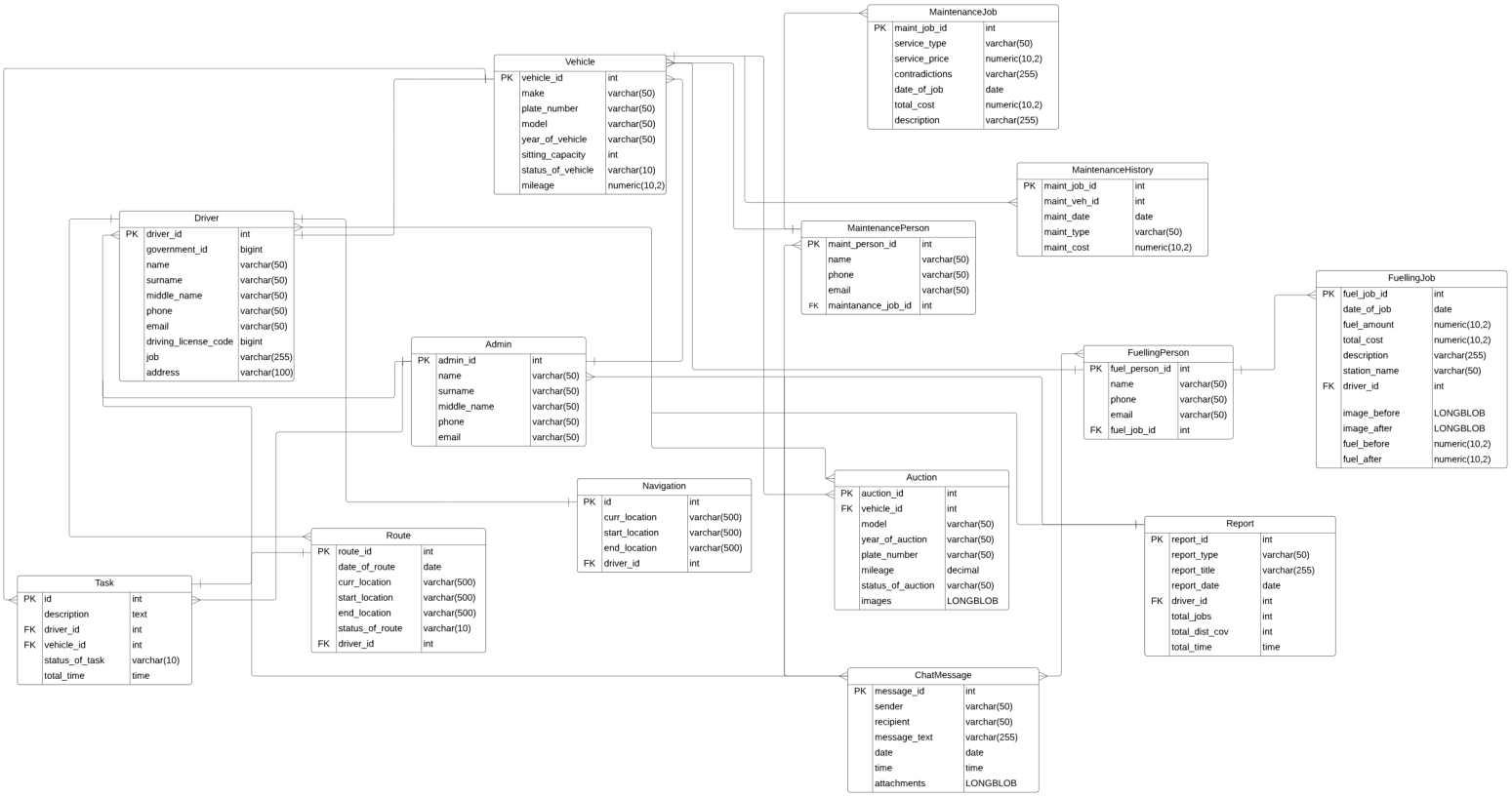

Figure 1: ERD Diagram

Figure 2: Landscape oriented ERD Diagram (for better view)

Overall project documentation:

Our endeavor began with the conceptualization of a comprehensive Vehicle Management System (VMS) tailored to manage an intricate network of vehicular operations. We meticulously defined entities that serve as the backbone of the VMS. These include the Driver, who steers the vehicle, the Vehicle itself which might range from sedans to trucks, the Admin who supervises the overall system, the Maintenance Person entrusted with vehicle upkeep, and the Fueling Person who ensures that the vehicles run smoothly. Additionally, we delved into operational entities like Task, which defines a driver's assignment, Navigation that aids in route optimization, and Route which delineates a journey's path. To augment our VMS's functionality, an Auction entity was integrated to facilitate the dynamic bidding and trading of vehicles. To visualize these entities, attributes, and relationships, we would need to sketch an Entity-Relationship Diagram (ERD).

Transitioning from conceptual to practical, we employed RDBMS software, channeling our groundwork into creating structured tables with defined attributes. Each table, mirroring our entities, was populated with columns that store specific data; for instance, the Driver table captures details like name, license number, and contact information. Ensuring data consistency and validity, we introduced cardinal relationships, constraints, and foreign keys, cementing the interconnectedness of our entities.

Infusing the VMS with sample data allowed us to emulate real-world scenarios. Through strategic SQL queries, we could extract, modify, and analyze data, thus confirming the system's agility and reliability. This intricate VMS now stands as a unified platform, harmonizing various vehicular facets from maintenance schedules to auction events.

To facilitate communication and reporting we added ChatMessage and Report entities, where Report is responsible for analysing and giving feedback about the work that was done by Driver.

In the context of data tracking, we added Maintenance History to monitor and document the maintenance and repairments of each vehicle.