Here’s the organization of your toll system's functionalities in a **Three-Tier Architecture** format:

### ****Presentation Tier (Frontend, User Interactions)****

1. **Login**: User inputs credentials and receives feedback (success/failure).
2. **Logout**: User selects logout and receives confirmation.
3. **Health Check**: Displays system connectivity and operational data (e.g., number of toll stations, passes).
4. **Toll Station Passes**: Interface to select a toll station and time period; shows passes list with details.
5. **Pass Analysis**: Interface to choose another operator and time period; displays a detailed transit event list.
6. **Passes Cost**: Input for operator and time period; outputs number of passes and total cost analysis.
7. **Charges by Other Operator**: Interface to select operator and period; displays the list of crossing data and costs.
8. **Net Charges with Other Operators**: Interface to select an operator and period; displays net total cost.
9. **View Information on Map**: Interactive map showing toll station locations and information; includes filtering functionality.

### ****Logic Tier (Backend, Business Logic)****

1. **Login Authentication**: Verifies credentials, generates an authorization token.
2. **Logout Management**: Invalidates and expires the session token.
3. **Health Check Logic**: Queries system status, database connections, and toll station statistics.
4. **Reset Stations**: Processes tollstations2024.csv to initialize toll station data.
5. **Reset Passes**: Deletes all passes and related entities; initializes default admin account.
6. **Add Passes**: Parses transit data from CSV and updates database columns.
7. **Toll Station Passes Logic**: Fetches data from the database based on toll station and time period.
8. **Pass Analysis Logic**: Retrieves and aggregates transit data for specified operators and time periods.
9. **Passes Cost Logic**: Calculates the total cost and count of passes for a specific operator and time period.
10. **Charges by Other Operators Logic**: Aggregates data for visiting operators and computes total costs.
11. **Net Charges Logic**: Computes net cost owed between operators, differentiating incoming and outgoing charges.

### ****Data Tier (Database, Data Storage)****

1. **User Authentication Data**: Stores user credentials and tokens.
2. **Toll Station Data**: Maintains records for toll stations, operators, and metadata.
3. **Passes Data**: Stores passage events, including timestamps, tollID, tag information, and charges.
4. **Operators Data**: Tracks operators and their associated data (e.g., tags, passes).
5. **Financial Records**: Contains data for financial settlements between operators.
6. **Geographical Data**: Stores location details for mapping toll stations.
7. **System Configuration Data**: Tracks system health and initialization details.

This organization ensures clear separation of concerns, scalability, and ease of maintenance. Each tier focuses on its specific responsibilities, facilitating system upgrades and enhancements without significant disruptions.

### ****Logic Tier (Business Logic)****

**1 User Management**

1.1 Validate user credentials for login and generate an authorization token.

1.2 Expire and invalidate the user session on logout

1.3 Monitor user session health and permissions for subsequent requests.

**2. System Management**

2.1 Perform health checks to confirm backend and database connectivity.

2.2 Provide real-time statistics on system health, toll stations, and passes.

**3 Station and Pass Management**

3.1 Parse tollstations2024.csv file and initialize or reset station data.

3.2 Remove all existing passes, associated tags, and reset admin credentials on reset.

3.3 Process CSV files for transit data, extracting timestamp, tollID, tagRef, tagHomeID, and charges, updating the database.

**4 Data Analysis**

4.1 Retrieve passes for a specific toll station and time period. - Filter by toll station and date range. - Aggregate details including station operator, pass type, and charges.

4.2 Analyze transit events for a specific operator and time period. - Group by stationOpID, tagOpID, and calculate the total number of passes. - Provide a detailed list of passes with timestamps, charges, and tag information.

4.3 Compute total cost and pass count between operators for a time period. - Calculate the amount owed by tag operator to station operator.

4.4 Generate a breakdown of charges by visiting operators. - Include total number of passes and costs per visiting operator.

4.5 Calculate net charges between two operators for a specific period. - Differentiate incoming and outgoing costs, and compute net total.

**5 Interactive Map Management**

5.1 Provide an interactive map displaying toll stations with pins.

5.2 Include details such as name, location, operator, and charges for various vehicle types.

5.3 Allow filtering by operator to display specific toll stations.

### ****Data Tier (Database, Data Storage)****

1. **Authentication and Sessions** 1.1 Store user credentials securely. 1.2 Maintain session tokens and expiration data for authentication.
2. **Toll Station Data** 2.1 Save details of toll stations (e.g., ID, name, location, operator). 2.2 Store metadata related to charges for different vehicle types.
3. **Pass Data** 3.1 Record each vehicle pass with timestamp, tollID, tagRef, tagHomeID, and charge. 3.2 Maintain relationships between passes, tags, and operators.
4. **Operator Data** 4.1 Track operator information including tags and station ownership.
5. **Financial Records** 5.1 Save financial settlements between operators (incoming and outgoing). 5.2 Log transaction timestamps and calculated amounts.
6. **Geographical Data** 6.1 Store geolocation and visual mapping data for toll stations.
7. **Configuration** 7.1 Maintain system settings and administrative data (e.g., reset logs).

### ****Presentation Tier (Frontend, User Interactions)****

**1 Login and Logout** 1.1 Interface for users to enter credentials and receive feedback. 1.2 Logout button to terminate sessions and display confirmation.

**2 Health Check** 2.1 Display system connectivity and operational statistics (e.g., number of stations and passes).

**3 Station and Pass Management** 3.1 Form to upload and initialize/reset station data from tollstations2024.csv. 3.2 Interface for uploading pass data via CSV files.

**4 Data Analysis** 4.1 Dropdown for selecting toll stations or operators, and date range pickers. 4.2 Display pass details for selected toll stations and operators in table format. 4.3 Show cost analysis with summarized and detailed views.

**5 Interactive Map** 5.1 Map interface with pins representing toll stations. 5.2 Pop-ups with station details when pins are clicked. 5.3 Filters for users to view stations by specific operators.