Project: Ride Sharing System

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1. Functional Requirements (FRs)

1. **User Account Management**
2. Users must be able to sign up, log in, and log out.
3. Users can update their profile information.
4. Password reset functionality must be provided.
5. **Ride Request Management**
6. Users can request a ride by entering pickup and destination locations.
7. The system must validate input locations before creating a ride request.
8. **Ride Matching Engine**
9. The system must search for available drivers near the pickup location.
10. Nearest available driver should be assigned automatically to the ride.
11. If no drivers are available, the user must be notified.
12. **Driver Management**
13. Drivers can register, log in, and update their availability.
14. Drivers can accept or cancel rides.
15. If a driver cancels a ride, the system should re-match the ride with another driver.
16. **ETA Calculation**
17. The system should calculate and display the estimated time of arrival (ETA) for the assigned driver.
18. **Notifications**
19. Users must receive notifications for ride status updates: ride matched, driver assigned, driver cancels, ride completed.
20. Drivers receive notifications for new ride requests.

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2. Non-Functional Requirements (NFRs)

1. **Performance**
2. The system should assign a driver within 5 seconds after a ride request is created.
3. ETA calculations must be updated in real-time.

4. **Reliability & Availability**
5. The system should handle multiple concurrent ride requests without failure.
6. The system should have uptime of at least 99%.
7. **Security**
8. User credentials must be encrypted in the database.
9. Only authenticated users and drivers can access the system.
10. **Usability**
11. The interface should be simple and intuitive for both users and drivers.
12. Notifications should be clear and actionable.
13. **Scalability**
14. The system should support an increasing number of users and drivers without performance degradation.

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3. Business Rules (BRs)

1. A ride can only be requested if the user has a valid account.
2. Drivers can only be assigned if they are marked as available in the system.
3. Users can only request one ride at a time.
4. A driver cannot be assigned to more than one active ride simultaneously.
5. If no drivers are available within a certain radius (e.g., 5 km), the system must notify the user immediately.
6. ETA calculation must consider current traffic conditions and driver location.
7. Cancellation by a driver triggers automatic re-matching of the ride with another available driver.
8. Ride requests are logged in the database for auditing and tracking purposes.

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4. Special Conditions (SCs)

1. **Peak Hours:** During high-demand periods, ride matching may take longer than usual; the system should handle queuing.
2. **Network Failure:** If the user or driver loses connection, the system must attempt reconnection and notify the other party.
3. **Location Errors:** If pickup or destination locations are invalid or unreachable, the ride request should be rejected with an appropriate message.
4. **Multiple Users Nearby:** If multiple users request rides in the same area, the system should optimize driver assignment to minimize ETA.
5. **Driver No-Show:** If a driver does not arrive within 10 minutes after being assigned, the system should reassign the ride automatically.

6. **Emergency Ride:** Certain users may have priority or emergency rides; the system should allow manual override for these cases.