

# Plus Points in Implementation (Overall Evaluation Criteria)

## 1. Authentication:

- Implement robust user authentication protocols to ensure secure access.

## 2. Cost Estimation - Time and Space:

- Conduct a thorough analysis of time and space complexity in the system.
- Utilize efficient algorithms and data structures to optimize both time and space requirements.

## 3. Handling System Failure Cases:

- Implement fault-tolerant mechanisms to address system failures.
- Employ backup and recovery strategies for data integrity.
- Develop comprehensive error recovery procedures to minimize downtime.

## 4. Object-Oriented Programming Language (OOPS):

- Choose a robust OOPS language for structured and modular code.
- Leverage OOPS principles such as encapsulation, inheritance, and polymorphism for maintainability and extensibility.

## 5. Trade-offs in the System:

- Clearly define and document trade-offs made during system design.
- Evaluate and communicate the rationale behind architectural and design decisions.
- Consider trade-offs in terms of performance, scalability, and maintainability.

## 6. System Monitoring:

- Implement comprehensive monitoring tools to track system performance.
- Utilize real-time dashboards and logging mechanisms to promptly identify and address issues.

## 7. Caching:

- Integrate caching mechanisms to enhance system response times.
- Utilize caching for frequently accessed data to reduce database load.
- Implement cache eviction policies for optimal resource utilization.

## 8. Error and Exception Handling:

- Develop a robust error and exception handling framework.
- Provide meaningful error messages for effective debugging.
- Regularly review and update error-handling strategies based on system usage patterns.

# Instructions for Project submissions:

## Document Format:

- Combine textual explanations, screenshots, and code snippets for clarity.
- Organize information in a structured manner, following a logical flow.

## Demonstration:

- Include a demonstration video showcasing key features of the ride-sharing platform.
- Alternatively, use screenshots to visually highlight the user interface and functionality.

# **Case Study: Vendor Cab and Driver Onboarding & Vendor Hierarchy Management:**

A Vendor Cab and Driver Onboarding System enables seamless **multi-level vendor management**, **vehicle onboarding**, **document verification**, and **hierarchical access control**. This system ensures that **Super Vendors** and **Sub Vendors** can efficiently manage fleets, onboard drivers, and maintain compliance, while providing structured delegation capabilities.

## **I. Multi-Level Vendor Hierarchy**

To support **large-scale fleet operations**, the system allows vendors to operate at **multiple hierarchical levels**, ensuring **structured access control and management**.

### **Flexible N-Level Hierarchy**

- Vendors can operate at **multiple levels**, forming a **parent-child relationship** (e.g., Super Vendor → Regional Vendor → City Vendor → Local Vendor).
- This hierarchy ensures that **fleet management responsibilities are distributed**, preventing operational bottlenecks.

### **Role-Based Access Management**

- Each vendor level has **specific roles and permissions**, ensuring **controlled access to vehicles, drivers, and fleet operations**.
- **Super Vendors** can **define access policies** for their sub-vendors.

#### **◆ Example Use Case:**

- A **National Fleet Operator (Super Vendor)** has **Regional Vendors**, who in turn manage **City-Level Vendors** handling **local cabs and drivers**.

#### **◆ Outcome:**

- Ensures **scalability** for large vendor networks.
- Prevents **unauthorized access** by implementing a structured hierarchy.

## **II. Super Vendor Access & Delegation**

Super Vendors have complete control over **sub-vendors, fleets, and driver onboarding**, ensuring centralized management.

### **Access Delegation to Sub Vendors**

- **Super Vendors** can grant specific access permissions to sub-vendors to manage:
  - **Fleet onboarding & assignments**
  - **Driver onboarding & verification**
  - **Operational tasks (booking management, payments, compliance tracking, etc.)**

### **Delegation of Authority**

- A **Super Vendor** can **authorize a sub-vendor** to act on their behalf for certain operations.
- The **delegated sub-vendor** can perform **all or selected** administrative actions under the Super Vendor's name.

#### Controlled Delegation Rights

- The **Super Vendor** can:
  - **Enable or revoke delegation at any time.**
  - Restrict access to **specific functions** (e.g., sub-vendor can onboard drivers but not process payments).
- ◆ **Example Use Case:**
  - A **Super Vendor managing a large fleet** can delegate responsibilities to a **Regional Vendor**, who further assigns tasks to **City-Level Vendors**.
  - The Super Vendor ensures **smooth workflow automation** without handling **every small task manually**.
- ◆ **Outcome:**
  - Reduces **administrative overhead** for Super Vendors.
  - Ensures **continuity** of operations even if the Super Vendor is unavailable

## III. Sub-Vendor Fleet & Driver Management

Sub Vendors are responsible for **managing vehicle onboarding, driver assignments, and compliance documentation**.

#### Vehicle & Driver Onboarding

- Sub Vendors can onboard:
  - **Cabs & Commercial Vehicles** – Enter vehicle details such as **registration number, model, seating capacity, fuel type, etc.**
  - **Drivers** – Add drivers and assign them to specific vehicles.

#### Driver Document Upload

- Sub Vendors can upload **essential driver documents**:
  - **Driving License (DL)**
  - **Vehicle Registration Certificate (RC)**
  - **Permit & Pollution Certificate.**

- ◆ **Example Use Case:**
  - A **City-Level Vendor** manages **local fleet onboarding and assigns drivers** to cabs.
  - The system **flags expired documents** and prevents non-compliant vehicles from operating.
- ◆ **Outcome:**
  - Ensures **regulatory compliance** with up-to-date documentation.
  - Reduces **manual document tracking efforts** with automated reminders.

## IV. Super Vendor's Complete Control Over Sub-Vendors

Super Vendors have **full visibility and control** over their entire sub-vendor network, including fleet status, driver assignments, and compliance reports.

#### Centralized Dashboard for Super Vendors

- A single dashboard provides:
  - Real-time view of all sub-vendors.
  - Fleet status updates (number of active/inactive vehicles).
  - Pending document verifications & approvals.
  - Driver availability tracking.

#### Super Vendor Action Control

- The Super Vendor can override sub-vendor actions, ensuring compliance and smooth operations.
  - System-wide reports & analytics help optimize fleet performance.
- ◆ Example Use Case:
- A Super Vendor detects compliance issues (e.g., missing insurance documents) and temporarily disables vehicle operations until resolved.
- ◆ Outcome:
- Maintains operational consistency & regulatory compliance across multiple vendor levels.
  - Gives Super Vendors full visibility and authority over their entire fleet network.