**Chapter 3(System Design)**

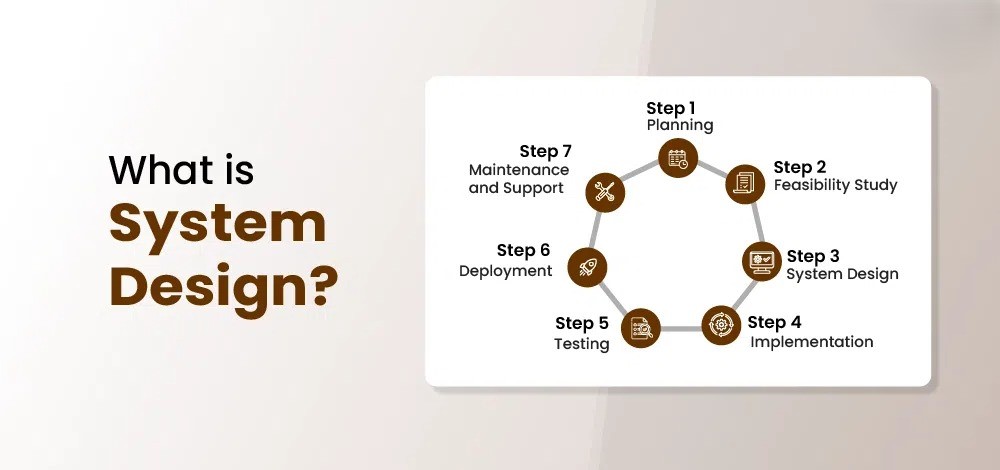
**3.1 Overall System Design**

**3.2 Data Dictionary**

**3.3 Input/output Design**

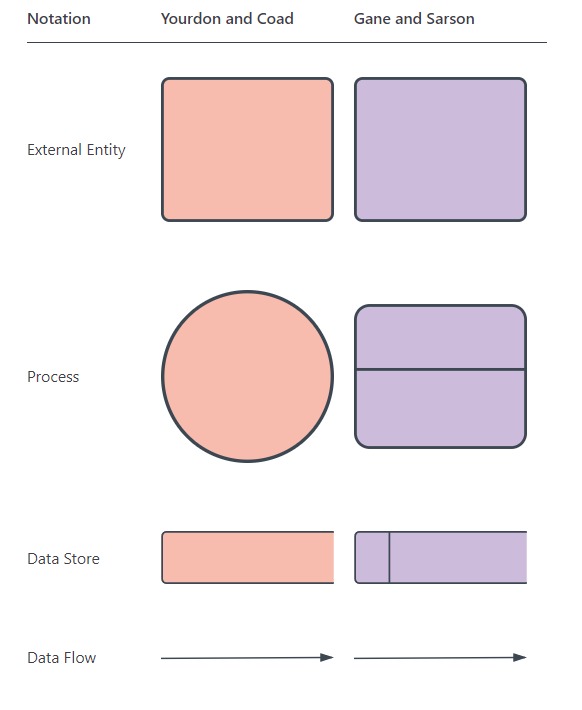
**3.1 System Design**

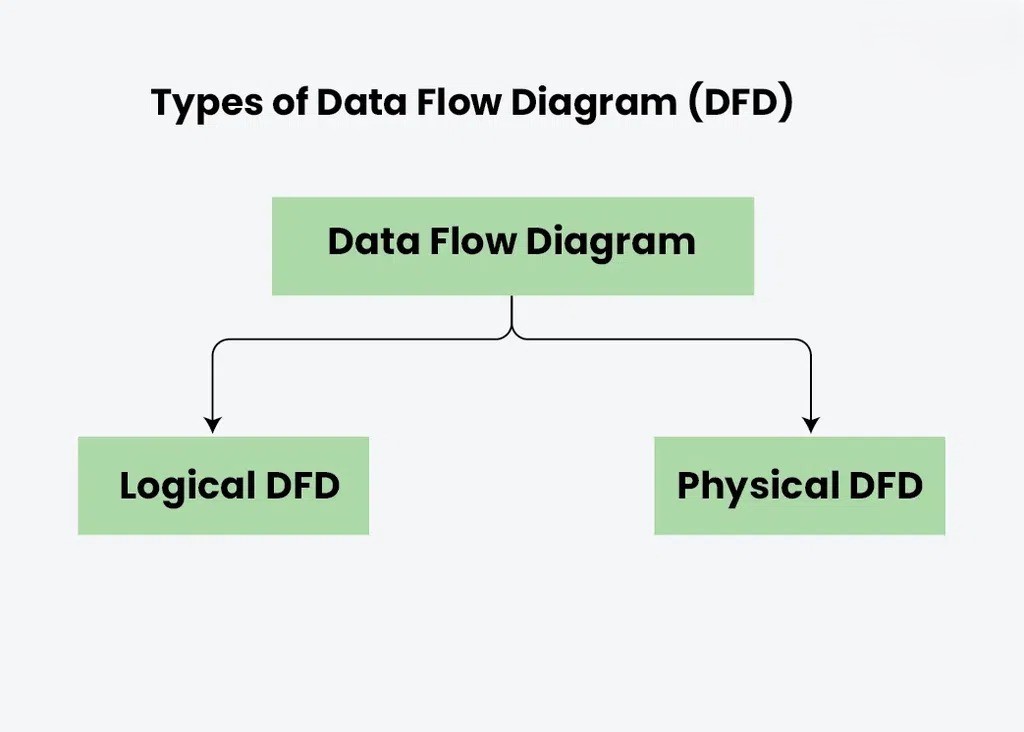
* **Systems Design** is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements.
* It involves translating user requirements into a detailed blueprint that guides the implementation phase.
* The goal is to create a well-organized and efficient structure that meets the intended purpose while considering factors like Scalability maintainability, and performance.



**Why Learn System Design?**

* In any development process, be it Software or any other tech, the most important stage is Design.
* Systems Design not only is a vital step in the development of the system but also provides the backbone to handle exceptional scenarios because it represents the business logic of software.
* **Data Flow Diagram:**
* Data Flow Diagram (DFD) represents the flow of data within information systems.
* Data Flow Diagrams (DFD) provide a graphical representation of the data flow of a system that can be understood by both technical and non-technical users.
* The models enable software engineers, customers, and users to work together effectively during the analysis and specification of requirements.
* The Data Flow Diagram (DFD) belongs to structured-analysis modeling tools.
* Data Flow diagrams are very popular because they help us to visualize the major steps and data involved in software-system processes.
* A data flow diagram (DFD) maps out the flow of information for any process or system.
* It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination.
* The two main types of notation used for data flow diagrams are Yourdon-cord and gane-Sarson.

****

* **External Entity**:
* An external entity is a source or destination of a data flow. Only those entities which originate or receive data are represented on a data flow diagram. The symbol used is a rectangular box.
* **Process**:
* A process show a transformation or manipulation of data flow within the system. The symbol used is an oval shape.
* **Data Store:**
* A data store does not generate any operations but simply holds data for later access. Data stores could consist of files held long term or a batch of documents stored briefly while they wait to be processed. Input flows to a data store include information or operations that change the stored data. Output flows would be data retrieved from the store.
* **Data Flow**:
* Movement of data between external entities, processes and data stores is represented with an arrow symbol, which indicates the direction of flow. This data could be electronic, written or verbal. Input and output data flows are labeled based on the type of data or its associated process or data store, and this name is written alongside the arrow.
* **DFD Types:**

### **Logical DFD**: Logical data flow diagram mainly focuses on the system process. We focus on the high-level processes and data flow without delving into the specific implementation details. Logical DFD is used in various organizations for the smooth running of system. Like in a Banking software system, it is used to describe how data is moved from one entity to another.

### **Physical DFD:** Physical data flow diagram shows how the data flow is actually implemented in the system. In the Physical Data Flow Diagram (DFD), we include additional details such as data storage, data transmission, and specific technology or system components. Physical DFD is more specific and close to implementation.

* MySQL was created by a Swedish company, MySQL AB, founded by Swedes David Axmark, Allan Larsson and Finnish Michael "Monty" Widenius.
* Original development of MySQL by Widenius and Axmark began in 1994. The first version of MySQL appeared on 23 May 1995.

**1.2 OBJECTIVE**

* **OBJECTIVE:**

1. **Efficient Fleet Management** **:-**

* Enable seamless management of vehicle inventory, including adding, updating, and tracking the availability of vehicles.

1. **Automated Booking Process** **:-**

* Provide a user-friendly interface to allow customers to browse, book, and manage rentals online.

1. **Customer Management** **:-**

* Maintain a comprehensive customer database for efficient tracking of customer history, preferences, and feedback.

1. **Payment Integration** **:-**

* Facilitate secure and multiple payment options, including credit cards, digital wallets, and cash transactions.

1. **Maintenance Scheduling** **:-**

* Keep track of vehicle maintenance schedules to ensure the fleet is in Best condition

1. **Dynamic Pricing Management** **:-**

* Allow dynamic pricing adjustments based on demand, location, and availability.

1. **User Notifications and Alerts** **:-**

* Notify customers about booking confirmations, payment reminders, vehicle due dates, and promotions.

**1.3 PURPOSE**

* **PURPOSE :**

1. **Streamline Operations** **:-**

* To automate and simplify the process of managing vehicle rentals, bookings, and returns, reducing manual effort and errors.

1. **Enhance Customer Experience** **:-**

* To provide customers with a seamless and convenient platform to book vehicles, access information, and complete transactions.

1. **Enhance Efficiency** **:-**

* To reduce operational delays by automating processes like billing, notifications, and maintenance tracking.

1. **Real-Time Availability :-**

* **To Ensure that customers have access to real-time information about vehical availability,allowing for immediate booking and reducing the chances of overbooking.**

1. **Cost-Effectiveness :-**

* To help rental companies reduce operational costs through automation, better resource management, and improved fleet utilization.

1. **Scalability :-**

* To provide a flexible system that can grow with the business, accommodating an increasing number of vehicles, customers, and locations.

1. **Admin Control Panel for management :-**

* An admin management the entire system, including adding new cars, managing user accounts, and other things.

**1.4 SCOPE**

* **SCOPE :**

1. **Car Inventory Management** **:-**

* Maintain a detailed database of all vehicles, including their availability, condition, and specifications.

1. **User Management** **:-**

* Customers can register, log in, and view their rental history.

1. **Feedback and Review system :-**

* Implement a mechanism for customers to provide feedback and reviews on their rental experience, aiding in service improvement.

1. **Admin Dashboard** **:-**

* Provide administrators with a centralized dashboard to monitor, manage, and control all aspects of the business.

1. **Payment Integration** **:-**

* Support multiple payment options such as credit/debit cards, digital wallets, and cash-on-delivery for a seamless checkout process.

1. **Online Booking System** **:-**

* Allow customers to browse, select, and book vehicles through an intuitive web or mobile application.

1. **Search and Filter :-**

* Customers car search for available cars based on parameters like car ,availability dates ,and price.

**1.5 APPLICABILITY**

* **APPLICABILITY :**

1. **Car Rental Companies** **:-**

* Designed for businesses offering vehicle rentals to streamline operations, manage fleets, and improve customer service.

1. **Travel Agencies** **:-**

* Used by travel agencies to include car rental services as part of their travel packages and itineraries.

1. **Corporate Use** **:-**

* Suitable for organizations managing employee transportation needs, such as short-term or long-term vehicle rentals for business trips.

1. **Tourist Destinations** **:-**

* Applicable in tourist-heavy areas to cater to visitors looking for self-driven or chauffeur-driven vehicles.

1. **Educational Institutions** **:-**

* Applicable for universities and colleges managing transportation for students or staff through rental services.

1. **Event Management Companies :-**

* Beneficial for organizing transportation for events, ensuring timely vehicle availability for guests and participants.

1. **Self-Drive Car Rental Services :-**

* Applicable for companies focusing on self-drive rentals, allowing customers to book and manage their rentals independently.

**Chepter 2(Requirement Analysis)**

2.1  Problem Definition

2.2  Requirement Specification

2.3  Hardware Software Requirement

2.4 Planning & Scheduling

**2.1 PROBLEM DEFINITION**

* **PROBLEM DEFINITION :**

1. **Manual Operations** **:-**

* Existing car rental processes often rely on manual record-keeping, leading to inefficiencies, errors, and delays in booking and fleet management.

1. **Lack of Online Accessibility** **:-**

* Many traditional systems do not offer online booking options, limiting customer convenience and accessibility.

1. **Inefficient Customer Management** **:-**

* Manual handling of customer information makes it difficult to track preferences, booking history, and feedback effectively.

1. **Overbooking and Underutilization** **:-**

* Poor inventory management can lead to overbooking, customer dissatisfaction, or underutilization of available vehicles.

1. **Delayed Maintenance Tracking** **:-**

* Without a proper system, scheduling and tracking vehicle maintenance becomes challenging, potentially compromising safety.

1. **Limited Communication and Notifications** **:-**

* Lack of automated notifications can lead to missed bookings, late returns, or poor customer engagement.

**2.2 REQUIREMENT SPECIFICATION DEFINITION**

The requirements for the car rental system can be categorized into functional and non-functional requirements.

**1.Functional Requirements**

**2.Non- Functional Requirements**

There are following functional and non-functional ewquirements.

**1.Funcational Requirements :**

* **User Authentication and Management** **:-**
* Allow users to register, log in, and manage their profiles securely.
* Provide role-based access for customers, administrators, and employees.
* **Vehicle Inventory Management** **:-**
* Maintain a database of all vehicles with details such as make, model, condition, availability, and pricing.
* Update vehicle status (e.g., available, rented, under maintenance)
* **Online** **Booking and Reservations** **:-**
* Enable customers to search for vehicles based on location, date, time, and vehicle type.
* Allow users to book vehicles online with real-time availability updates.
* **Dynamic Pricing** **:-**
* Implement dynamic pricing based on factors like demand, season, vehicle type, and rental duration.
* **Payment Processing** **:-**
* Generate invoices and provide payment receipts.
* **Customer Management** **:-**
* Store customer details, booking history, and preferences for personalized services.
* Enable loyalty programs or discounts for repeat customers.
* **Admin Dashboard** **:-**
* Provide administrators with a centralized dashboard to manage bookings, monitor vehicles, and oversee system activities.
* **Search and Filter Options** **:-**
* Enable users to filter vehicles by type, price, availability, and features.

**2.Non-Functional Requirements :**

* **Performance** **:-**
* The system should handle at least 500 concurrent users without performance degradation.
* Ensure that all operations (e.g., booking, payment processing) are completed within 2-3 seconds.
* **Scalability** **:-**
* The system should be able to scale to support additional users, vehicles, and locations as the business grows.
* **Availability** **:-**
* Ensure 99.9% uptime to guarantee continuous availability of the system for users.
* **Usability** **:-**
* Provide a user-friendly and intuitive interface for both customers and administrators.
* **Reliability** **:-**
* Ensure the system operates consistently without crashes or failures during high-demand periods.

**2.3 HARDWARE SOFTWARE REQUIRMENT**

* **HARDWARE REQUIREMENT :**

|  |  |
| --- | --- |
| **Processor** | Multicore processor (intel i3, i5) |
| **RAM** | 2 GB & Above |
| **Storage** | 64 GB & Above |

* **SOFTWARE REQUIREMENTS :**

|  |  |
| --- | --- |
| **Operating System** | Windows 7 & Above |
| **Code Editor** | Visual studio code or Any Other |
| **Wamp server** | For PHP,My-SQL, |
| **Browser** | Chrome ,Fire Fox,Edge |

**2.4 PLANNING & SCHEDULING**

* **PLANNING :**
* Planning is the process of setting goals, outlining strategies, and determining the steps necessary to achieve specific objectives. It involves thinking ahead, organizing resources, and making decisions to ensure that a project or activity progresses efficiently and effectively.
* The Importance Of Planning is Minimizes Risk, Increases Efficiency, Provides Direction.
* **SCHEDULING :**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Week-1** | **Week-2** | **Week-3** | **Week-4** |
| **Month-1**  **December** | Finalize project Definition  Choose Front  End & Back End tools | Research about project.  Plan UI/UX design. | Finalize system flow and interactions.  Set up Wamp Server . | Set up project in VS Code.  start coding. |
| **Month-2**  **January** | Build a home page layout.  Download car images and details. | Define Admin  Functionality. | Make user Login & RegisterForm.  Documentation  Start Unit -1. | Complate Unit-1 & Unit-2 Documentation |