**Practical No-05**

**Modeling Data Flow Diagram & Control Flow Diagram**

**Aim of the Experiment:** To design and analyze the **Data Flow Diagram (DFD)** and **Control Flow Diagram (CFD)** for the Garage Management System to visualize the flow of data and the functional components within the system.

**Introduction:** A Garage Management System (GMS) is developed to streamline the operations of a garage, including vehicle servicing, inventory management, billing, and customer interactions. Data Flow Diagrams (DFDs) help in understanding the flow of data between different components, while Control Flow Diagrams (CFDs) depict the logical flow of control in the system.

**Objectives:**

* Identify external entities and functionalities of the **Garage Management System**.
* Analyze the flow of data across different system components.
* Represent the flow of data using **Data Flow Diagrams (DFDs)**.
* Develop a **Control Flow Diagram (CFD)** to illustrate the logical sequence of operations.

**Data Flow Diagram**

DFD provides the functional overview of a system. The graphical representation easily overcomes any gap between ’user and system analyst’ and ‘analyst and system designer’ in understanding a system. Starting from an overview of the system it explores detailed design of a system through a hierarchy. DFD shows the external entities from which data flows into the process and also the other flows of data within a system. It also includes the transformations of data flow by the process and the data stores to read or write a data.

**Graphical notations for Data Flow Diagram**

| **Term** | **Notation** | **Remarks** |
| --- | --- | --- |
| External entity |  | Name of the external entity is written inside the rectangle |
| Process |  | Name of the process is written inside the circle |
| Data store |  | A left-right open rectangle is denoted as data store; name of the data store is written inside the shape |
| Data flow |  | Data flow is represented by a directed arc with its data name |

**Context diagram and leveling DFD**

We start with a broad overview of a system represented in level 0 diagram. It is known as context diagram of the system. The entire system is shown as single process and also the interactions of external entities with the system are represented in context diagram. Further we split the process in next levels into several numbers of processes to represent the detailed functionalities performed by the system. Data stores may appear in higher level DFDs.

**Case Study: Data Flow and Control Flow in a Garage Management System**

**Introduction**

A Garage Management System (GMS**)** is designed to streamline the operations of a vehicle service center by automating tasks such as customer bookings, vehicle servicing, spare parts inventory, and billing. This system ensures an efficient workflow by managing data flow between different entities and controlling the sequence of operations to avoid bottlenecks in the servicing process.

**Problem Statement**

A local garage was facing issues with manual data entry, poor service tracking, and inefficient resource allocation. Due to the lack of a structured **data flow**, the garage struggled with lost customer records, inconsistent service updates, and inventory shortages. Additionally, **no control flow** was in place to ensure that tasks followed a proper sequence, leading to delays and miscommunication among mechanics and staff.

**Proposed Solution**

To solve these challenges, a **Garage Management System** was designed with:

* A **centralized database** to store customer details, vehicle history, and service records.
* **Data flow diagrams (DFD)** to map how information moves between customers, mechanics, inventory, and billing.
* **Control flow mechanisms** to ensure that jobs are processed in the right order, preventing task overlaps and inefficiencies.

**Implementation Details**

1. **Data Flow Diagram (DFD)**:
   * **Level 0 DFD** (Context Diagram) shows interactions between customers, mechanics, and the system.
   * **Level 1 DFD** expands the data movement between subsystems like appointment scheduling, job assignment, and invoice generation.
2. **Control Flow**:

* When a customer books an appointment, the system checks availability and assigns a mechanic.
* After service completion, the system updates inventory, generates a bill, and notifies the customer.
* **Conclusion:** The **Data Flow Diagram (DFD) and Control Flow Diagram (CFD)** for the **Garage Management System** provide a clear visualization of data movement and process interactions within the system. By designing these diagrams, we can identify key functional components and improve the efficiency of the garage's operations. These diagrams serve as an essential tool in system analysis and design, helping in better decision-making and implementation.



