**Step 1: Understanding and Defining the Problem (Analysing)**

**Problem Statement:**

The aim is to design the logic for a **low-cost automated pet feeder system** for a local animal shelter. The shelter needs a device that can:

* Dispense food for cats and dogs at set times.
* Detect whether food has been consumed or not or how much consumed.
* Alert staff when an issue arises (e.g., no food dispensed, or pet hasn’t eaten).

The focus of this task is not to build the hardware, but to simulate how the system would operate logically using sensors, timers, and alert mechanisms. This simulation will serve as a foundation for future hardware implementation using simple, affordable components like servo motors and basic sensors.

**Assumptions:**

The design is based on the following assumptions to ensure simplicity and feasibility:

* Uses low-cost parts (servo motor, basic weight sensors).
* The system dispenses only dry pet food.
* Feeding occurs twice daily at fixed times (e.g., 08:00 and 18:00).
* A food level sensor checks whether there is enough food in the container before dispensing.
* Power supply is always available.

**Limitations:**

The system has the following limitations.

* Only one bowl is served by each feeder at a time.
* Portions sizes are basic presets (dog vs cat).
* Sensors may be inaccurate, and simple thresholds are applied.

**System Inputs and Outputs:**

Inputs:

* Current time (from clock)
* Feeding Schedule
* Food level sensor
* Bowl weight sensor (before and after feeding)

Outputs:

* Activate the servo motor to dispense food.
* Trigger an alert if food isn’t consumed or dispensing fails.
* Trigger an alert when the food is running low.

**Operational Details:**

* Default portions sizes: 100g for Dogs, 80g for Cats
* Low food threshold: 15% of the bowl’s capacity
* “Consumed” criteria: Bowl weight must by at least 40g (for cats) or 80g (for dogs) within 10 minutes
* Dispense action: Servo rotates 90o for 1s (one portion)
* Retry/alert If there’s no change in bowl weight after 10 minutes, an alert is triggered.

**Edge Cases Scenarios:**

* Bowl is empty (food dispensing not possible)
* Servo malfunction (dispense command issued but no weight change, and bowl isn’t empty)
* Faulty sensor (giving incorrect data)

**System Sketch:**

