**INVENTORY MANAGEMENT**

**Importance of Data Structures and Algorithms:**

Data structures and algorithms are critical for efficiently managing and retrieving data in large inventories. Efficient data retrieval is essential for various operations such as:

* **Searching for a Product:** Quickly finding a product based on its ID or category.
* **Checking Stock Levels:** Monitoring the quantity of products in real-time.
* **Fetching Product Details:** Retrieving information about a product for reporting or display purposes.

As the warehouse expands and the number of products increases, the data structures and algorithms used must scale accordingly.

**Suitable Data Structures:**

* **ArrayList:** An ArrayList is a resizable array implementation in Java. Unlike fixed-size arrays, ArrayList can dynamically increase or decrease its size when elements are added or removed. The elements in an ArrayList are stored in a contiguous memory location, making it easy to iterate over the elements with a simple for-loop or iterator. It automatically resizes.
* **HashMap:** A HashMap is a data structure that stores elements in key-value pairs. Each key is unique and maps to exactly one value, making it ideal for scenarios where fast retrieval of data is needed. It uses a hash table to store the key-value pairs. It employs a hash function to compute an index into an array of buckets or slots, from which the desired value can be found. It is relatively fast in accessing values as the keys are hashed.

**Analysis**

* **Time Complexity Analysis:**
  + **Add:** O(1) on average (due to hashing)
  + **Update:**
    - **HashMap Lookup:** O(1)
    - **Linear Search in List:** O(n)
    - **Updating Attributes:** O(n)
  + **Delete:** O(n) on average
* **Optimization:** Using a HashMap ensures constant-time complexity for most operations. If memory usage becomes an issue, consider using more memory-efficient data structures or indexing mechanisms.