Exercise 1: Inventory Management System

**Time Complexity:**

* **Add Operation:** O(1) on average in a HashMap due to the constant-time complexity for insertions.
* **Update Operation:** O(1) as it involves retrieving an element by its key and updating fields.
* **Delete Operation:** O(1) on average because it involves removing an entry by its key.

**Optimization Considerations:**

* **Data Integrity:** It is ensured that product IDs are unique to avoid overwriting products in the HashMap.
* **Scalability:** As the inventory grows, we consider distributing the load using techniques like sharding or using more sophisticated data structures like B-trees if sorted access or range queries are needed.
* **Concurrency:** For a concurrent environment, we consider using ConcurrentHashMap to handle simultaneous read and write operations safely.