Quantum Bookstore System – Report

Overview:

The Bookstore System is a Java-based simulation of a bookstore that supports managing inventory and processing orders for both physical and digital books. The system implements clean object-oriented principles with abstraction (Book), interfaces (Sellable), and separation of concerns for inventory management and delivery services.

Key Features:

- Supports PaperBooks (with stock tracking) and EBooks (delivered digitally).
- Handles ShowcaseBooks as non-sellable items.
- Batch delivery for multiple quantities (physical books ship as one package, eBooks send one email).
- Delivery is simulated using MailService and ShippingService.
- Edge cases are validated (invalid ISBN, zero/negative quantity, null delivery contact, boundary stock).

Test Coverage:

A corner-detailed test suite (BookstoreTest) demonstrates:

- Happy Path: Bulk purchases of PaperBooks and EBooks.
- Invalid Inputs: Handles zero/negative quantities and blank/null delivery info.
- Inventory Edge Cases: Detects duplicate ISBNs and removed books.
- Boundary Conditions: Purchases with remaining stock or excessive quantities.
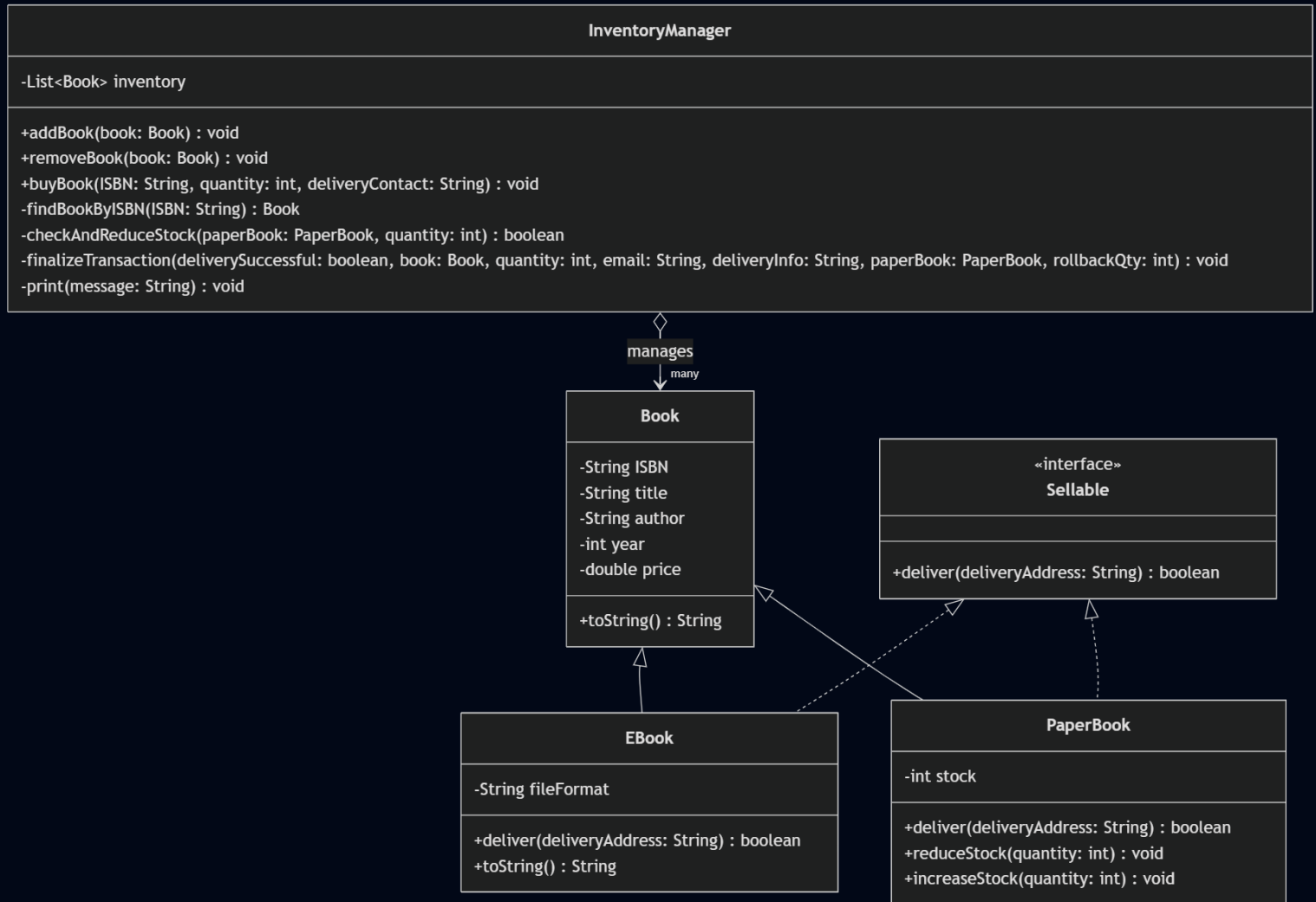- System Behavior: Buying from an empty inventory, rejecting non-sellable books.

Design Decisions:

- Stock reduction is encapsulated within PaperBook.deliver().
- Early validation in InventoryManager.buyBook() prevents invalid operations.
- The system avoids multithreading complexities for simplicity.

UML Diagram:

See the next page

InventoryManager

-List<Book> inventory

+addBook(book: Book) : void
+removeBook(book: Book) : void
+buyBook(ISBN: String, quantity: int, deliveryContact: String) : void
-findBookByISBN(ISBN: String) : Book
-checkAndReduceStock(paperBook: PaperBook, quantity: int) : boolean
-finalizeTransaction(deliverySuccessful: boolean, book: Book, quantity: int, email: String, deliveryInfo: String, paperBook: PaperBook, rollbackQty: int) : void
-print(message: String) : void

manages
many

Book

-String ISBN
-String title
-String author
-int year
-double price

+toString() : String

«interface»
Sellable

+deliver(deliveryAddress: String) : boolean

EBook

-String fileFormat

+deliver(deliveryAddress: String) : boolean
+toString() : String

PaperBook

-int stock

+deliver(deliveryAddress: String) : boolean
+reduceStock(quantity: int) : void
+increaseStock(quantity: int) : void

*getters and setters are omitted (trivial)

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