ESOF 322: Homework 3

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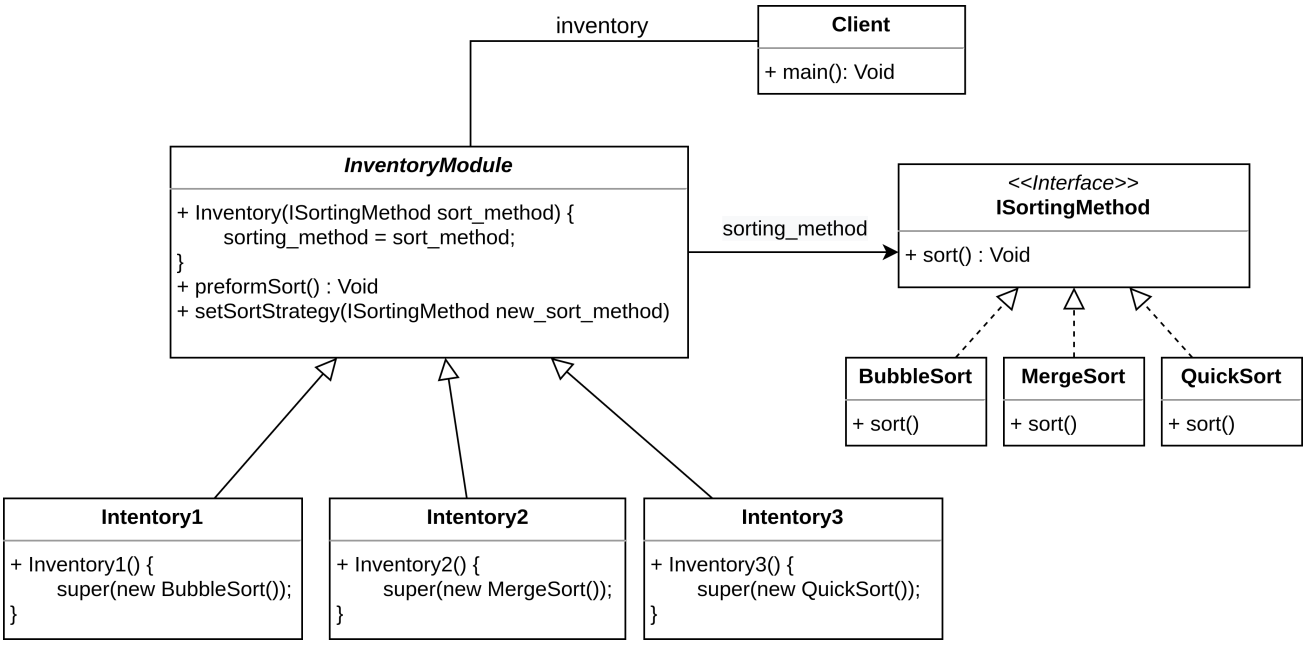
Class Diagram



Java Code

Console Output

```
----------------------------------------
ESOF-322: Homework 3
----------------------------------------

Step 1: Select an Inventory Module
----------------------------------------
1 - Inventory1
2 - Inventory2
3 - Inventory3
('c' to exit) > 1

New Inventory Module Created
----------------------------------------
Inventory Module: Inventory1
Default sorting method: BubbleSort

Step 2: Perform (default) Sorting Method
----------------------------------------
--> Inventory1::sort()
The sorting method is: BubbleSort
--> BubbleSort::sort()
Performing BubbleSort...

Step 3: Request User Selection (Sorting Method)
----------------------------------------
1 - BubbleSort
2 - MergeSort
3 - QuickSort
('c' to exit) > 3

Step 4: Dynamically Change Sorting Method
----------------------------------------
--> Inventory1::setSortMethod(ISortingMethod method)
Dynamically set sorting method to: QuickSort

Step 5: Perform Sorting Method
----------------------------------------
--> Inventory1::sort()
The sorting method is: QuickSort
--> QuickSort::sort()
Performing Quicksort...
```

Client Class

```java
// Client.java

import java.util.Scanner;

/**
 * Client class
 *
 * - Main driver class for Homework 3
```

```
 *   - (i.e. has public static void main(String[] args))
 *
 */
public class Client {

    // main method
    public static void main(String[] args) {

        // initialize local Inventory variable
        InventoryModule inventory = null;
        // initialize scanner, to read in user input from console
        Scanner console = new Scanner(System.in);
        // variable to store user input
        String user_selection = null;
        int user_int_selection = 0;

        /*
         * The following variables are used to by the application. Either for output to
         * the console or to maintain the running state
         */

        InventoryModule[] inventory_arr = new InventoryModule[3];
        int inv_index = 0;
        // string "constant", used for output to the user
        String dv = "----------------------------------------";
        // continue running application loop with true
        Boolean running = true;

        // output to user (via console)
        System.out.printf("%s\n%s\n%s\n", dv, "ESOF-322: Homework 3", dv);

        do {

            // Step 1: Select an Inventory Module
            // ------------------------------------------------------
            // - prompt the user to select an Inventory module.
            // - create the selected Inventory module and assign it
            // to the local variable 'inventory'.
            //

            // output to user
            System.out.printf("\n%s\n%s\n", "Step 1: Select an Inventory Module", dv);
            System.out.printf("%d - %s\n%d - %s\n%d - %s\n", 1, "Inventory1", 2, "Inventory2", 3, "Inventory3");

            // get user input from console (Scanner)
            System.out.print("('c' to exit) > ");
            user_selection = console.nextLine();

            // checked if user wants to exit
            if (user_selection.charAt(0) == 'c') { // user wants to exit
                running = false; // set running state to false
                continue;
            }

            try {
                user_int_selection = Integer.parseInt(user_selection);
            } catch (Exception e) {
                System.out.printf("%s: %s\n", "User Input Error", e.
```

```
getMessage());
                continue;
            }

            inv_index = user_int_selection - 1;

            if (inventory_arr[inv_index] == null) {

                System.out.printf("\n%s\n%s\n", "New Inventory Module Created", dv);
                switch (user_int_selection) {
                    case 1:
                        inventory = new Inventory1();
                        break;
                    case 2:
                        inventory = new Inventory2();
                        break;
                    case 3:
                        inventory = new Inventory3();
                        break;
                    default:
                        System.out.println("\nInvalid input: " + user_selection);
                        continue;
                }
                inventory_arr[inv_index] = inventory;
            } else {
                inventory = inventory_arr[inv_index];
            }

            // Step 2: Perform default sorting method
            // -------------------------------------------------------
            //
            System.out.printf("\n%s\n%s\n", "Step 2: Perform (default) Sorting Method", dv);
            inventory.preformSort();

            // Step 3: Request User Selection
            // -------------------------------------------------------
            // Get a new sorting method from the user to dynamically
            // change the inventory's sorting behavior
            //

            System.out.printf("\n%s\n%s\n", "Step 3: Request User Selection (Sorting Method)", dv);
            System.out.printf("%d - %s\n%d - %s\n%d - %s\n", 1, "BubbleSort", 2, "MergeSort", 3, "QuickSort");

            // get user input from console (Scanner)
            System.out.print("('c' to exit) > ");
            user_selection = console.nextLine();

            // checked if user wants to exit
            if (user_selection.charAt(0) == 'c') { // user wants to exit
                running = false; // set running state to false
                continue;
            }

            // Step 4: Dynamically Change Sorting Method
            // -------------------------------------------------------
            // Set the inventory's sorting method dynamically
```

```
            //

            System.out.printf("\n%s\n%s", "Step 4: Dynamically Change Sorting Method", dv);
            ISortingMethod new_sorting_method;
            switch (user_selection) {
                case "1": // Bubble Sort
                    new_sorting_method = new BubbleSort();
                    break;
                case "2": // Merge Sort
                    new_sorting_method = new MergeSort();
                    break;
                case "3": // Quick Sort
                    new_sorting_method = new QuickSort();
                    break;
                default: // Invalid selection from user input
                    System.out.println("\nInvalid input: " + user_selection);
                    continue;
            }

            inventory.setSortMethod(new_sorting_method); // Change dynamically to BubbleSort

            // Step 5: Perform Sort
            // ------------------------------------------------------
            // Invoke the inventories sorting method behavior
            //

            System.out.printf("\n%s\n%s\n", "Step 5: Perform Sorting Method", dv);
            inventory.preformSort();

        } while (running); // END of application's loop

        console.close(); // Close the console (Scanner)

    } // END of Client::main method

} // END of Client class
```

ISortingMethod Interface

```
// ISortingMethod.java

/**
 * ISortingMethod (Interface)
 *
 * This is the "behavior" interface for the sorting_method
 *
 * Each of the unique sorting method type
 * must implement this interface, allowing the
 * Inventory Modules to sort a sorting behavior
 * as a composite value.
 *
 * Each child class must provide:
 * - method "sort()"
 *
 */
```

```java
public interface ISortingMethod {

    // all Sorting classes must implement their own sort function
    public void sort();

} // END of ISortingMethod class
```

BubbleSort Class

```java
// BubbleSort.java

/**
 * BubbleSort class
 *
 * This is one of three possible sorting methods.
 * Each sorting type implements the ISortingMethod interface.
 *
 */
public class BubbleSort implements ISortingMethod {

    // BubbleSorts implementation of the sort method
    public void sort() {
        System.out.println("--> BubbleSort::sort()\nPerforming BubbleSort...");
    } // END of sort()

} // END of BubbleSort class
```

MergeSort Class

```java
// MergeSort.java

/**
 * MergeSort class
 *
 * This is one of three possible sorting methods.
 * Each sorting type implements the ISortingMethod interface.
 *
 */
public class MergeSort implements ISortingMethod {

    // MergeSorts implementation of the sort method
    public void sort() {
        System.out.println("--> MergeSort::sort()\nPerforming MergeSort...");
    } // END of sort()

} // END of MergeSort class
```

QuickSort Class

```java
// QuickSort.java

/**
```

```
 * QuickSort class
 *
 * This is one of three possible sorting methods.
 * Each sorting type implements the ISortingMethod interface.
 *
 */
public class QuickSort implements ISortingMethod {

    // QuickSorts implementation of the sort method
    public void sort() {
        System.out.println("--> QuickSort::sort()\nPerforming Quicksort...");
    } // END of sort()

} // END of QuickSort class
```

InventoryModule Class

```
// InventoryModule.java

/**
 * Inventory class (Abstract)
 *
 * The individual Inventory Modules (Inventory1, Inventory2, and Inventory3)
 * extend this class to inherit common functionality.
 *
 * Child classes define the "default" sorting method, or behavior,
 * in their constructors, which are passed to the parent constructor
 * via super(ISortingMethod)
 *
 * The property 'sorting_method' or type ISortingMethod allows for
 * composition of a unique sorting method, and allows us to change
 * the behavior at runtime.
 *
 */
abstract public class InventoryModule {

    // The interface used by each unique sorting method type.
    public ISortingMethod sorting_method;


    // constructor
    public InventoryModule(ISortingMethod sort_method) {
        // set the default sorting method
        sorting_method = sort_method;
        // output statement to user
        System.out.println("Inventory Module: " +
                this.toString().split("@")[0] +
                " \nDefault sorting method: " +
                sorting_method.toString().split("@")[0]);

    } // END of constructor


    /*
     * Sort()
     *
     * Invokes the sorting method behavior
     *
```

```
     */
    public void preformSort() {
        // output statement to user
        System.out.println("--> "+this.toString().split("@")[0] + "::sort()\
    nThe sorting method is: " + sorting_method.toString().split("@")[0]);
        sorting_method.sort();

    } // END of sort()


    /*
     * setSortMethod()
     *
     * changes the default sorting method (dynamically) to the new one chosen
     by the user
     *
     */
    public void setSortMethod(ISortingMethod new_sort_method) {
        // dynamically set the sorting method (behavior)
        sorting_method = new_sort_method;
        // cleanly prints out the new default sorting method to the user
        System.out.println("\n--> "+this.toString().split("@")[0]+"::
    setSortMethod(ISortingMethod method)\nDynamically set sorting method to: "
     + sorting_method.toString().split("@")[0]);

    } // END of setSortMethod()

} // END of Inventory class
```

Inventory1 Class

```
// Inventory1.java

/**
 * Inventory1 class
 *
 * This inventory module extends the InventoryModule class.
 *
 * The default sorting method is: Bubble Sort
 */
public class Inventory1 extends InventoryModule {

    // constructor
    public Inventory1() {
        // call parent constructor
        super(new BubbleSort()); // set default sorting method: BubbleSort

    } // END of constructor

} // END of Inventory1 class
```

Inventory2 Class

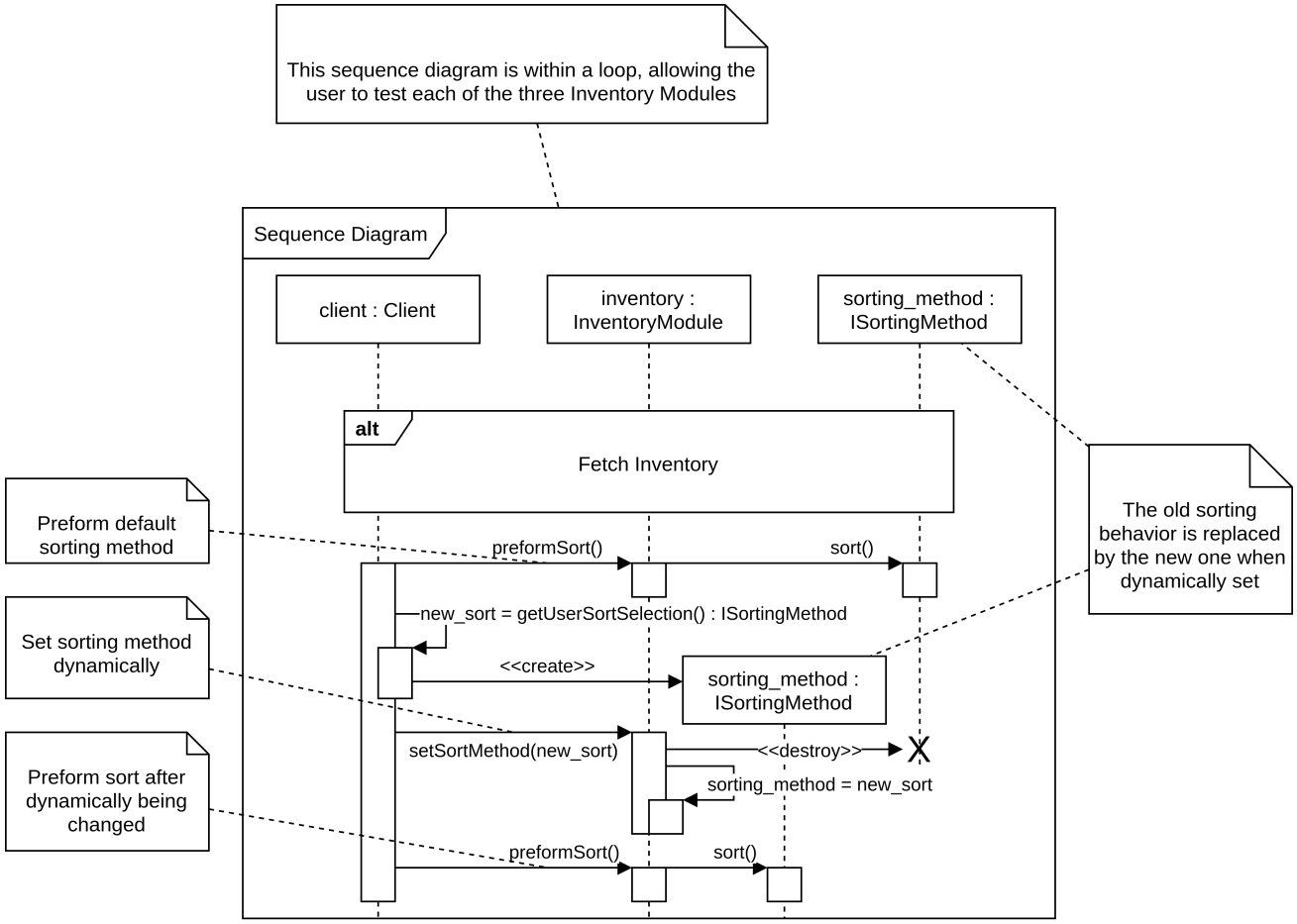
```
// Inventory2.java

/**
```

```
 * Inventory2 class
 *
 * This inventory module extends the InventoryModule class.
 *
 * The default sorting method is: Merge Sort
 */
public class Inventory2 extends InventoryModule {

    // constructor
    public Inventory2() {
        // call parent constructor
        super(new MergeSort()); // set default sorting method: MergeSort

    } // END of constructor

} // END of Inventory2 class
```

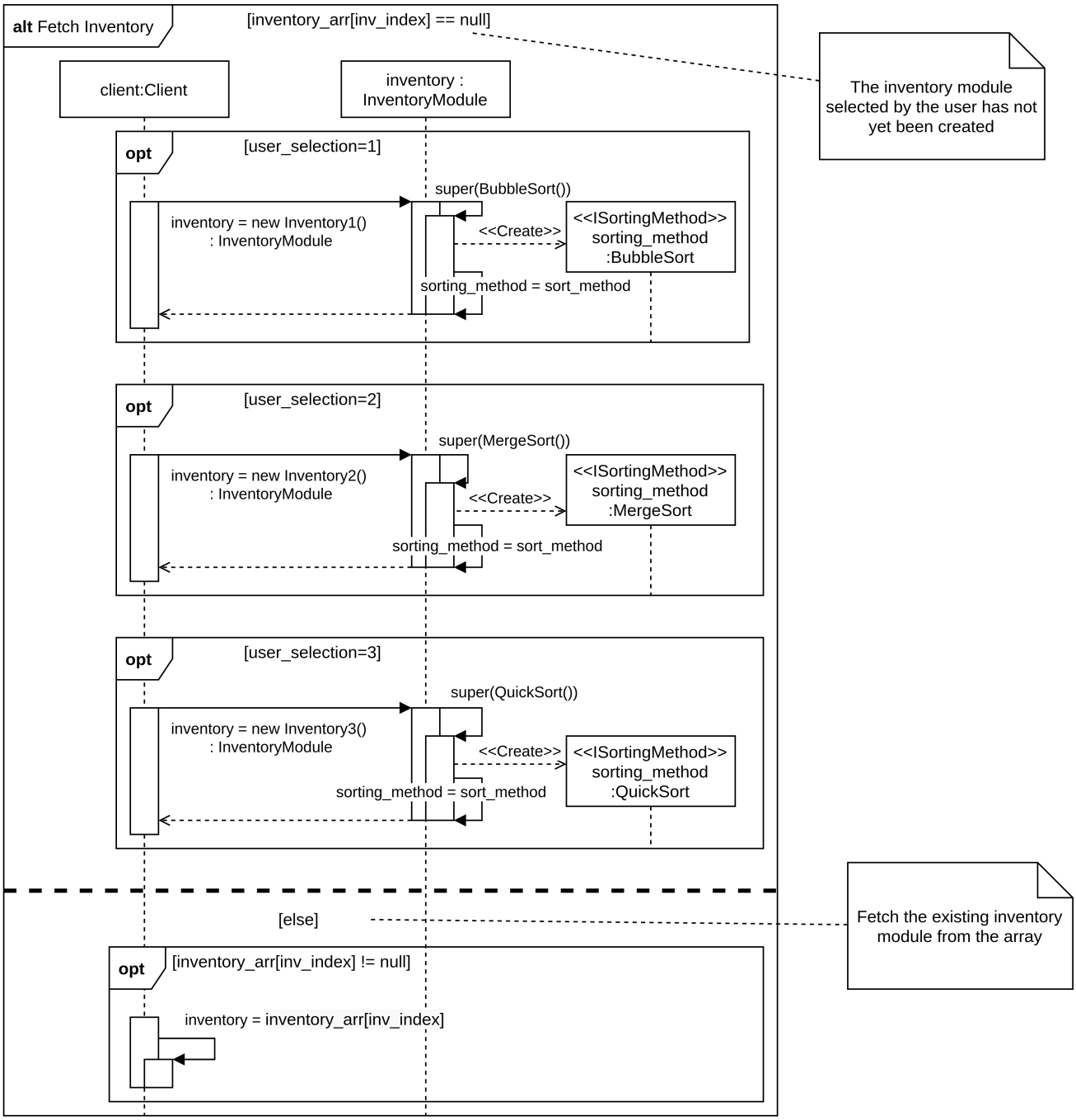
Inventory3 Class

```
// Inventory3.java

/**
 * Inventory3 class
 *
 * This inventory module extends the InventoryModule class.
 *
 * The default sorting method is: Quick Sort
 */
public class Inventory3 extends InventoryModule {

    public Inventory3() {
     // call parent constructor
        super(new QuickSort()); // set default sorting method: QuickSort

    } // END of constructor

} // END of Inventory3 class
```

Sequence Diagram



Note: "Fetch Inventory" Alternative Fragment is on the next page.


alt Fetch Inventory
[inventory_arr[inv_index] == null]
client:Client
inventory : InventoryModule
The inventory module selected by the user has not yet been created
opt
[user_selection=1]
super(BubbleSort())
inventory = new Inventory1() : InventoryModule
<<Create>>
<<ISortingMethod>> sorting_method :BubbleSort
sorting_method = sort_method
opt
[user_selection=2]
super(MergeSort())
inventory = new Inventory2() : InventoryModule
<<Create>>
<<ISortingMethod>> sorting_method :MergeSort
sorting_method = sort_method
opt
[user_selection=3]
super(QuickSort())
inventory = new Inventory3() : InventoryModule
<<Create>>
<<ISortingMethod>> sorting_method :QuickSort
sorting_method = sort_method
[else]
Fetch the existing inventory module from the array
opt
[inventory_arr[inv_index] != null]
inventory = inventory_arr[inv_index]