**Test Closure Report**

**Summary of the Testing Process:**

During the testing process, Blackbox testing and Whitebox testing were performed initially to ensure that there were no obvious bugs within each minimal unit, and that the program's functionality aligned with the expected outcomes.

Subsequently, integration testing was conducted to ensure the proper functioning of all functions when working together.

Finally, acceptance tests were executed to validate that all requirements were covered post-testing.

Throughout the entire testing phase, a total of 123 cases were tested, comprising 52 Blackbox tests, 44 Whitebox tests, and 27 integration tests.

**Failed Tests & Results Comparison:**

Currently, all 123 test cases have passed without any failures. While there were indeed instances of failures during earlier stages of development and testing, for example:

In the function void getAllTruckPaths(struct Shipment s, struct Truck truck, const struct Map\* map, struct Route routes[MAX\_ROUTES], int\* size), we replace  \*routes[(\*size)] = &result; (\*size)++; with routes[(\*size)++] = result; which caused all output to be “ship tomorrow”

All bugs that were causing failures have now been fully resolved.

**Time Taken to Conduct Testing:**

Number of team member: 6

Test Project ran in 7 week, teams worked in 5 days per week and 7 hours for a day.

The total time taken : 1470 hours

**Total Costs:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Recourses** | **Cost** | **Amount** | **Total Cost** |
| Testing team | hourly rate: $40 | \*1470 | $58800 |
| Windows 11 operating system | $180 | \*2 | $58980 |

**Test Coverage:**

The test suite covers the code for both main.c, mapping.c and delivery.c. It covers all the lines of the code. It focuses on testing various functions for correctness, edge cases, and possible invalid inputs.

**The Defects we found:**

We found total 7 defects. They are in the 6 functions. And the description is below.

1. isValid Weight: call validate() and print the corresponding output incorrectly
2. TruckLimitFactorComparison: didn't find the right truck
3. isDestination: didn't find the best route and didn't get the correct output
4. isValidSize: Test with a box size of 0.0 cubic meter, which is an invalid size.   
   Expects 0 as it is not a valid size. (Actual result: 1)
5. getAllTruckPaths: there are issues with using a local variable result as a pointer and storing its address in the routes array. Since result is a local variable within the scope of the for loop, storing its address in the routes array could lead to undefined behavior when accessing it later outside the function.
6. main(2 bugs in main):

(1) return value isn't correct, it will exit incorrectly

(2) didn't exit the program when user input "0 0 x"

Please find the attached diagram below for details. We have found the defects in time and have fixed all of them. We create a ticket on Jira and marked it as “BUG”. Once we found them, we fixed them and performed regression testing, all the tests are passed. Finally, the code works properly.

|  |  |  |  |
| --- | --- | --- | --- |
| **Function/acceptance/requirement** | **Test Run** | **Bugs Fixed/Description** | **Passed** |
| Blackbox Test:isValidPoint | F1001 | No Bug | √ |
| F1002 | No Bug | √ |
| F1003 | No Bug | √ |
| F1004 | No Bug | √ |
| F1005 | No Bug | √ |
| F1006 | No Bug | √ |
| F1007 | No Bug | √ |
| F1008 | No Bug | √ |
| Blackbox Test:isValidWeight | F2001 | No Bug | √ |
| F2002 | No Bug | √ |
| F2003 | No Bug | √ |
| F2004 | No Bug | √ |
| F2005 | the program call validate() and print the corresponding output incorrectly | √ |
| F2006 | No Bug | √ |
| F2007 | No Bug | √ |
| F2008 | No Bug | √ |
| Blackbox Test:isValidSize | F3001 | No Bug | √ |
| F3002 | No Bug | √ |
| F3003 | No Bug | √ |
| F3004 | No Bug | √ |
| F3005 | No Bug | √ |
| F3006 | No Bug | √ |
| F3007 | No Bug | √ |
| F3008 | No Bug | √ |
| Blackbox Test: TruckLimitFactorComparison | F5001 | didn't find the right truck | √ |
| F5002 | No Bug | √ |
| F5003 | No Bug | √ |
| F5004 | No Bug | √ |
| F5005 | No Bug | √ |
| F5006 | No Bug | √ |
| Blackbox Test:IsDestination | F7001 | didn't find the best route and didn't get the correct output | √ |
| F7002 | No Bug | √ |
| F7003 | No Bug | √ |
| F7004 | No Bug | √ |
| F7005 | No Bug | √ |
| F7006 | No Bug | √ |
| Blackbox Test:FindBestRoute | F8001 | No Bug | √ |
| F8002 | No Bug | √ |
| F8003 | No Bug | √ |
| F8004 | No Bug | √ |
| F8005 | No Bug | √ |
| WhiteboxTest:IsValidPoint | W1001 | No Bug | √ |
| W1002 | No Bug | √ |
| W1003 | No Bug | √ |
| W1004 | No Bug | √ |
| W1005 | No Bug | √ |
| W1006 | No Bug | √ |
| W1007 | No Bug | √ |
| WhiteboxTest:IsValidWeight | W2001 | No Bug | √ |
| W2002 | No Bug | √ |
| W2003 | No Bug | √ |
| W2004 | No Bug | √ |
| W2005 | No Bug | √ |
| WhiteboxTest:IsValidSize | W3001 | No Bug | √ |
| W3002 | No Bug | √ |
| W3003 | No Bug | √ |
| W3004 | Test with a box size of 0.0 cubic meter, which is an invalid size.  Expects 0 as it is not a valid size. (Actual result: 1) | √ |
| W3005 | No Bug | √ |
| W3006 | No Bug | √ |
| WhiteboxTest:truckLimitFactorComparison | W5001 | No Bug | √ |
| W5002 | No Bug | √ |
| W5003 | No Bug | √ |
| W5004 | No Bug | √ |
| Whitebox Test:IsDestination | W6001 | No Bug | √ |
| W6002 | No Bug | √ |
| W6003 | No Bug | √ |
| W6004 | No Bug | √ |
| W6005 | No Bug | √ |
| W6006 | No Bug | √ |
| Whitebox Test:FindBestRoute | W7001 | No Bug | √ |
| W7002 | No Bug | √ |
| W7003 | No Bug | √ |
| W7004 | No Bug | √ |
| W7005 | No Bug | √ |
| Whitebox test:getAllTruckPaths | TCC001 | there are issues with using a local variable result as a pointer and storing its address in the routes array. Since result is a local variable within the scope of the for loop, storing its address in the routes array could lead to undefined behavior when accessing it later outside the function. | √ |
| Whitebox test:Main | TCC002 | return value isn't correct, it will exit incorrectly | √ |
| Whitebox test:Main | TCC003 | didn't exit the program when user input "0 0 x" | √ |
| Integration Tests:Validate Test | I1001 | No Bug | √ |
| I1002 | No Bug | √ |
| I1003 | No Bug | √ |
| I1004 | No Bug | √ |
| I1005 | No Bug | √ |
| I1006 | No Bug | √ |
| I1007 | No Bug | √ |
| I1008 | No Bug | √ |
| I1009 | No Bug | √ |
| I1010 | No Bug | √ |
| Integration Tests: FindPossibleTruck | I2001 | No Bug | √ |
| I2002 | No Bug | √ |
| I2003 | No Bug | √ |
| I2004 | No Bug | √ |
| I2005 | No Bug | √ |
| I2006 | No Bug | √ |
| I2007 | No Bug | √ |
| Integration Test:FindRouteforTruck | I3001 | No Bug | √ |
| I3002 | No Bug | √ |
| I3003 | No Bug | √ |
| I3004 | No Bug | √ |
| I3005 | No Bug | √ |
| I3006 | No Bug | √ |
| I3007 | No Bug | √ |
| Integration Test:FindBestRoute | I4001 | No Bug | √ |
| I4002 | No Bug | √ |
| I4003 | No Bug | √ |
| I4004 | No Bug | √ |
| I4005 | No Bug | √ |
| I4006 | No Bug | √ |
| Acceptance Tests | A1001 | No Bug | √ |
| A1002 | No Bug | √ |
| A1003 | No Bug | √ |
| A1004 | No Bug | √ |
| A1005 | No Bug | √ |
| A1005 | No Bug | √ |
| A1006 | No Bug | √ |
| A1007 | No Bug | √ |
| A1008 | No Bug | √ |
| A1009 | No Bug | √ |
| A1010 | No Bug | √ |
| A1011 | No Bug | √ |