Testing Report (Student #5)



**Group Number:** C1.037  
**Repository:** <https://github.com/DP2-C1-037/Acme-ANS-D04>

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**Date:** 25/05/2025

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# Executive Summary

This report summarizes the results of the testing activities conducted for the project, organized into two main sections: functional testing and performance testing.

The functional testing section provides a detailed overview of the executed test cases, categorized by entity and application functionality. Each test case includes a brief description of the inputs or actions taken and assesses its effectiveness in identifying bugs.

The performance testing section evaluates the system’s response in execution time by running the same functional tests on two different machines. It features statistical charts and reports 95% confidence intervals for the observed wall times on each computer. A formal hypothesis test was also carried out to determine whether the performance differences between the two machines were statistically significant.

The purpose of this evaluation is to assess the system’s stability, reliability, and performance across varied execution environments.

# Revision Table

|  |  |  |
| --- | --- | --- |
| **Revision Number** | **Date** | **Description** |
| 1.0 | 25/05/2025 | Initial Draft |
| 2.0 | 26/05/2025 | Last draft |

# Introduction

Software testing plays a critical role in ensuring reliability, correctness, and performance of an application. This report outlines the testing procedures and results for a project subjected to both functional and performance evaluation.

The first focus area, functional testing, aimed to verify that the application's features behave as expected under a range of input conditions. Test cases were grouped by entity and feature, with each case designed to validate specific functional requirements.

The performance testing chapter evaluates the time taken for the system to respond to requests under realistic functional loads. These tests were conducted on two different computers to assess how performance varies with hardware. A 95% confidence interval was calculated for each system's mean response time. Additionally, a statistical hypothesis test was carried out to determine whether the observed performance differences between the two computers were significant.

The structure of this report is as follows:

* Section 4 covers the functional tests, organized per feature. Each entry includes a summary, input or action taken, response, and bugs detected. It also includes performance-related data.
* Section 5 presents a concise summary of findings.
* Section 6 lists any references consulted (if applicable).

# Contents

This section is divided into two chapters: one dedicated to functional testing and the other to performance testing.

The functional testing chapter provides a comprehensive list of all test cases implemented, grouped by application feature. For each test case, a concise description is included along with a note on its effectiveness in detecting defects.

The performance testing chapter presents a statistical analysis of the system's response times when executing these test cases on two different computers. It includes charts, 95% confidence intervals for execution times, and a hypothesis test to compare performance across systems.

## Listing of Test Cases

The following test cases, unless specified otherwise, were performed with:

* technician1
* On Maintenance Record with id = 465
* On Task with id = 493
* On Involved In with id = 517

“-“ is considered a negative response, “+” a positive one.

### Maintenance Record

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Id | Test Case | Input Value or Action Performed | Response | Bugs detected |
|  | LIST | | |  |
| TMR-001 | List Maintenance Records | /technician/maintenance-record/list | + | 0 |
| TMR-002 | List Maintenance Records **without a Technician Role / with Anonymous User** | /technician/maintenance-record/list with anonymous user | 500 – Access not authorised | 0 |
|  | LIST-MINE | | |  |
| TMR-003 | List Logged Technician’s Maintenance Records | /technician/maintenance-record/list-mine with technician1 and technician3 | + | 0 |
| TMR-004 | List Logged Technician’s Maintenance Records **without a Technician Role / with Anonymous User** | /technician/maintenance-record/list-mine with anonymous user | 500 – Access not authorised | 0 |
|  | SHOW | | |  |
| TMR-005 | Show details of an **unpublished** Maintenance Record with its Technician | /technician/maintenance-record/show?id=465 | + | 0 |
| TMR-006 | Show details of a **published** Maintenance Record | /technician/maintenance-record/show?id=490 | + | 0 |
| TMR-007 | Show details of a Maintenance Record **without a Technician Role / with Anonymous User** | /technician/maintenance-record/show?id=465 with anonymous user | 500 – Access not authorised | 0 |
| TMR-008 | Show details of an **unpublished** Maintenance Record **created by another Technician** | /technician/maintenance-record/show?id=465 with technician2 | 500 – Access not authorised | 0 |
| TMR-009 | Show details of a **non-existing** Maintenance Record | /technician/maintenance-record/show?id=999 | 500 – Access not authorised | 0 |
|  | CREATE | | |  |
| TMR-010 | Create Maintenance Record with **Empty Fields** |  | - | 0 |
| TMR-011 | Create Maintenance Record with **minimum *maintenanceDate* value and minimum decrement (Min - Δ)** | 1999/12/31 23:59 | - | 0 |
| TMR-012 | Create Maintenance Record with **minimum *maintenanceDate* value (Min)** | 2000/01/01 00:00 | + | 0 |
| TMR-013 | Create Maintenance Record with **minimum *maintenanceDate* value and minimum increment (Min + Δ)** | 2000/01/01 00:01 | + | 0 |
| TMR-014 | Create Maintenance Record with **maximum *maintenanceDate* value and minimum decrement (Max - Δ)** | 2024/12/31 23:59 | + | 0 |
| TMR-015 | Create Maintenance Record with **maximum *maintenanceDate* value (Max)** | 2025/01/01 00:00 | + | 0 |
| TMR-016 | Create Maintenance Record with **maximum *maintenanceDate* value and minimum increment (Max + Δ)** | 2025/01/01 00:01 | - | 0 |
| TMR-017 | Create Maintenance Record with **“PENDING” s*tatus*** | PENDING | + | 0 |
| TMR-018 | Create Maintenance Record with **“IN\_PROGRESS” s*tatus*** | IN\_PROGRESS | + | 0 |
| TMR-019 | Create Maintenance Record with **minimum *nextInspectionDueDate* value and minimum decrement (Min - Δ)** | 2025/01/01 0:00 | - | 0 |
| TMR-020 | Create Maintenance Record with **minimum *nextInspectionDueDate* value (Min)** | 2025/01/01 0:01 | + | 0 |
| TMR-021 | Create Maintenance Record with **minimum *nextInspectionDueDate* value and minimum increment (Min + Δ)** | 2025/01/01 0:02 | + | 0 |
| TMR-022 | Create Maintenance Record with **maximum *nextInspectionDueDate* value and minimum decrement (Max - Δ)** | 2200/12/31 23:58 | + | 0 |
| TMR-023 | Create Maintenance Record with **maximum *nextInspectionDueDate* value (Max)** | 2200/12/31 23:59 | + | 0 |
| TMR-024 | Create Maintenance Record with **maximum *nextInspectionDueDate* value and minimum increment (Max + Δ)** | 2201/01/01 0:00 | - | 0 |
| TMR-025 | Create Maintenance Record with **minimum *estimatedCost* value and minimum decrement (Min - Δ)** | EUR -0.01 | - | 0 |
| TMR-026 | Create Maintenance Record with **minimum *estimatedCost* value (Min)** | EUR 0.00 | + | 0 |
| TMR-027 | Create Maintenance Record with **minimum *estimatedCost* value and minimum increment (Min + Δ)** | EUR 0.01 | + | 0 |
| TMR-028 | Create Maintenance Record with **maximum *estimatedCost* value and minimum decrement (Max - Δ)** | EUR 999999.99 | + | 0 |
| TMR-029 | Create Maintenance Record with **maximum *estimatedCost* value (Max)** | EUR 1000000.00 | + | 0 |
| TMR-030 | Create Maintenance Record with **maximum *estimatedCost* value and minimum increment (Max + Δ)** | EUR 1000000.01 | - | 0 |
| TMR-031 | Create Maintenance Record with **empty /** **minimum *notes* value (and minimum decrement) (Empty / Min / Min - Δ)** |  | + | 0 |
| TMR-032 | Create Maintenance Record with **minimum *notes* value and minimum increment (Min + Δ)** | L | + | 0 |
| TMR-033 | Create Maintenance Record with **maximum *notes* value and minimum decrement (Max - Δ)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor | + | 0 |
| TMR-034 | Create Maintenance Record with **maximum *notes* value (Max)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor\* | + | 0 |
| TMR-035 | Create Maintenance Record with **maximum *notes* value and minimum increment (Max + Δ)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor i | - | 0 |
| TMR-036 | Create Maintenance Record with ***notes* value containing Hindu characters** | โลเร็ม อิปซัม | + | 0 |
| TMR-037 | Create Maintenance Record with ***notes* value containing Arabic characters** | لوريم إيبسوم | + | 0 |
| TMR-038 | Create Maintenance Record with ***notes* value containing Chinese characters** | 洛伦·伊普森 | + | 0 |
| TMR-039 | Create Maintenance Record with ***notes* value as a HTML injection** | <marquee>Hacked</marquee> | + | 0 |
| TMR-040 | Create Maintenance Record with ***notes* value as a XSS injection** | <script>alert(‘Hacked!’);</script> | + | 0 |
| TMR-041 | Create Maintenance Record with ***notes* value as a SQL injection** | ' or 'A' = 'A | + | 0 |
| TMR-042 | Create Maintenance Record with **valid *Aircraft*** | Aircraft with id = 128 | + | 0 |
| TMR-043 | Create Maintenance Record with **valid values** | Insert valid values. | + | 0 |
| TMR-044 | Create Maintenance Record with **Different Technicians** | Create MR with technician1 and technician2 | + | 0 |
| TMR-045 | Create Maintenance Record **without a Technician Role / with Anonymous User** | /technician/maintenance-record/create with anonymous user | 500 – Access not authorised | 0 |
| TMR-046 | Create Maintenance Record **with non-existing Technician** | Technician with id = -1 | Does not bind. | 0 |
| TMR-047 | Create Maintenance Record **with Technician other than User** | Technician with id = 463 | Does not bind. | 0 |
| TMR-048 | Create Maintenance Record **with invalid Aircraft** | Aircraft with id = 999 | 500 – Access not authorised | 0 |
| TMR-049 | Create Maintenance Record with **“COMPLETED” s*tatus* (invalid value)** | Write COMPLETED using F12 | 500 – Access not authorised | 0 |
|  | UPDATE | | |  |
| TMR-050 | Update Maintenance Record with **Empty Fields** |  | - | 0 |
| TMR-051 | Update Maintenance Record with **minimum *maintenanceDate* value and minimum decrement (Min - Δ)** | 1999/12/31 23:59 | - | 0 |
| TMR-052 | Update Maintenance Record with **minimum *maintenanceDate* value (Min)** | 2000/01/01 00:00 | + | 0 |
| TMR-053 | Update Maintenance Record with **minimum *maintenanceDate* value and minimum increment (Min + Δ)** | 2000/01/01 00:01 | + | 0 |
| TMR-054 | Update Maintenance Record with **maximum *maintenanceDate* value and minimum decrement (Max - Δ)** | 2024/12/31 23:59 | + | 0 |
| TMR-055 | Update Maintenance Record with **maximum *maintenanceDate* value (Max)** | 2025/01/01 00:00 | + | 0 |
| TMR-056 | Update Maintenance Record with **maximum *maintenanceDate* value and minimum increment (Max + Δ)** | 2025/01/01 00:01 | - | 0 |
| TMR-057 | Update Maintenance Record with **“PENDING” s*tatus*** | PENDING | + | 0 |
| TMR-058 | Update Maintenance Record with **“IN\_PROGRESS” s*tatus*** | IN\_PROGRESS | + | 0 |
| TMR-059 | Update Maintenance Record with **“COMPLETED” s*tatus*** | COMPLETED | + | 0 |
| TMR-060 | Update Maintenance Record with **minimum *nextInspectionDueDate* value and minimum decrement (Min - Δ)** | 2025/01/01 0:00 | - | 0 |
| TMR-061 | Update Maintenance Record with **minimum *nextInspectionDueDate* value (Min)** | 2025/01/01 0:01 | + | 0 |
| TMR-062 | Update Maintenance Record with **minimum *nextInspectionDueDate* value and minimum increment (Min + Δ)** | 2025/01/01 0:02 | + | 0 |
| TMR-063 | Update Maintenance Record with **maximum *nextInspectionDueDate* value and minimum decrement (Max - Δ)** | 2200/12/31 23:58 | + | 0 |
| TMR-064 | Update Maintenance Record with **maximum *nextInspectionDueDate* value (Max)** | 2200/12/31 23:59 | + | 0 |
| TMR-065 | Update Maintenance Record with **maximum *nextInspectionDueDate* value and minimum increment (Max + Δ)** | 2201/01/01 0:00 | - | 0 |
| TMR-066 | Update Maintenance Record with **minimum *estimatedCost* value and minimum decrement (Min - Δ)** | EUR -0.01 | - | 0 |
| TMR-067 | Update Maintenance Record with **minimum *estimatedCost* value (Min)** | EUR 0.00 | + | 0 |
| TMR-068 | Update Maintenance Record with **minimum *estimatedCost* value and minimum increment (Min + Δ)** | EUR 0.01 | + | 0 |
| TMR-069 | Update Maintenance Record with **maximum *estimatedCost* value and minimum decrement (Max - Δ)** | EUR 999999.99 | + | 0 |
| TMR-070 | Update Maintenance Record with **maximum *estimatedCost* value (Max)** | EUR 1000000.00 | + | 0 |
| TMR-071 | Update Maintenance Record with **maximum *estimatedCost* value and minimum increment (Max + Δ)** | EUR 1000000.01 | - | 0 |
| TMR-072 | Update Maintenance Record with **empty /** **minimum *notes* value (and minimum decrement) (Empty / Min / Min - Δ)** |  | + | 0 |
| TMR-073 | Update Maintenance Record with **minimum *notes* value and minimum increment (Min + Δ)** | L | + | 0 |
| TMR-074 | Update Maintenance Record with **maximum *notes* value and minimum decrement (Max - Δ)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor | + | 0 |
| TMR-075 | Update Maintenance Record with **maximum *notes* value (Max)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor\* | + | 0 |
| TMR-076 | Update Maintenance Record with **maximum *notes* value and minimum increment (Max + Δ)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor i | - | 0 |
| TMR-077 | Update Maintenance Record with ***notes* value containing Hindu characters** | โลเร็ม อิปซัม | + | 0 |
| TMR-078 | Update Maintenance Record with ***notes* value containing Arabic characters** | لوريم إيبسوم | + | 0 |
| TMR-079 | Update Maintenance Record with ***notes* value containing Chinese characters** | 洛伦·伊普森 | + | 0 |
| TMR-080 | Update Maintenance Record with ***notes* value as a HTML injection** | <marquee>Hacked</marquee> | + | 0 |
| TMR-081 | Update Maintenance Record with ***notes* value as a XSS injection** | <script>alert(‘Hacked!’);</script> | + | 0 |
| TMR-082 | Update Maintenance Record with ***notes* value as a SQL injection** | ' or 'A' = 'A | + | 0 |
| TMR-083 | Update Maintenance Record with **valid values** |  | + | 0 |
| TMR-084 | Update Maintenance Record with **Different Technicians** | Update MR with technician1 and technician2 | + | 0 |
| TMR-085 | Update Maintenance Record **without a Technician Role / with Anonymous User** | /technician/maintenance-record/update?id=465 with anonymous user | 500 – Access not authorised | 0 |
| TMR-086 | Update Maintenance Record **created by another Technician** | /technician/maintenance-record/update?id=465 with technician2 | 500 – Access not authorised | 0 |
| TMR-087 | Update **published** Maintenance Record | /technician/maintenance-record/update?id=490 | 500 – Access not authorised | 0 |
| TMR-088 | Update **non-existing** Maintenance Record | /technician/maintenance-record/update?id=999 | 500 – Access not authorised | 0 |
| TMR-089 | Update Maintenance Record **with non-existing Technician** | Technician with id = -1 | Does not bind. | 0 |
| TMR-090 | Update Maintenance Record **with Technician other than User** | Technician with id = 463 | Does not bind. | 0 |
| TMR-091 | Update Maintenance Record **with invalid Aircraft** | Aircraft with id = 999 | 500 – Access not authorised | 0 |
|  | PUBLISH | | |  |
| TMR-092 | Publish Maintenance Record with **Empty Fields** |  | - | 0 |
| TMR-093 | Publish Maintenance Record with **minimum *maintenanceDate* value and minimum decrement (Min - Δ)** | 1999/12/31 23:59 | - | 0 |
| TMR-094 | +Publish Maintenance Record with **minimum *maintenanceDate* value (Min)** | 2000/01/01 00:00 | + | 0 |
| TMR-095 | Publish Maintenance Record with **minimum *maintenanceDate* value and minimum increment (Min + Δ)** | 2000/01/01 00:01 | + | 0 |
| TMR-096 | Publish Maintenance Record with **maximum *maintenanceDate* value and minimum decrement (Max - Δ)** | 2024/12/31 23:59 | + | 0 |
| TMR-097 | Publish Maintenance Record with **maximum *maintenanceDate* value (Max)** | 2025/01/01 00:00 | + | 0 |
| TMR-098 | Publish Maintenance Record with **maximum *maintenanceDate* value and minimum increment (Max + Δ)** | 2025/01/01 00:01 | - | 0 |
| TMR-099 | Publish Maintenance Record with **“PENDING” s*tatus*** | PENDING | - | 0 |
| TMR-100 | Publish Maintenance Record with **“IN\_PROGRESS” s*tatus*** | IN\_PROGRESS | - | 0 |
| TMR-101 | Publish Maintenance Record with **“COMPLETED” s*tatus*** | COMPLETED | + | 0 |
| TMR-102 | Publish Maintenance Record with **minimum *nextInspectionDueDate* value and minimum decrement (Min - Δ)** | 2025/01/01 0:00 | - | 0 |
| TMR-103 | Publish Maintenance Record with **minimum *nextInspectionDueDate* value (Min)** | 2025/01/01 0:01 | + | 0 |
| TMR-104 | Publish Maintenance Record with **minimum *nextInspectionDueDate* value and minimum increment (Min + Δ)** | 2025/01/01 0:02 | + | 0 |
| TMR-105 | Publish Maintenance Record with **maximum *nextInspectionDueDate* value and minimum decrement (Max - Δ)** | 2200/12/31 23:58 | + | 0 |
| TMR-106 | Publish Maintenance Record with **maximum *nextInspectionDueDate* value (Max)** | 2200/12/31 23:59 | + | 0 |
| TMR-107 | Publish Maintenance Record with **maximum *nextInspectionDueDate* value and minimum increment (Max + Δ)** | 2201/01/01 0:00 | - | 0 |
| TMR-108 | Publish Maintenance Record with **minimum *estimatedCost* value and minimum decrement (Min - Δ)** | EUR -0.01 | - | 0 |
| TMR-109 | Publish Maintenance Record with **minimum *estimatedCost* value (Min)** | EUR 0.00 | + | 0 |
| TMR-110 | Publish Maintenance Record with **minimum *estimatedCost* value and minimum increment (Min + Δ)** | EUR 0.01 | + | 0 |
| TMR-111 | Publish date Maintenance Record with **maximum *estimatedCost* value and minimum decrement (Max - Δ)** | EUR 999999.99 | + | 0 |
| TMR-112 | Publish Maintenance Record with **maximum *estimatedCost* value (Max)** | EUR 1000000.00 | + | 0 |
| TMR-113 | Publish Maintenance Record with **maximum *estimatedCost* valueand minimum increment (Max + Δ)** | EUR 1000000.01 | - | 0 |
| TMR-114 | Publish Maintenance Record with **empty /** **minimum *notes* value (and minimum decrement) (Empty / Min / Min - Δ)** |  | + | 0 |
| TMR-115 | Publish Maintenance Record with **minimum *notes* value and minimum increment (Min + Δ)** | L | + | 0 |
| TMR-116 | Publish Maintenance Record with **maximum *notes* value and minimum decrement (Max - Δ)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor | + | 0 |
| TMR-117 | Publish Maintenance Record with **maximum *notes* value (Max)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor\* | + | 0 |
| TMR-118 | Publish Maintenance Record with **maximum *notes* value and minimum increment (Max + Δ)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor i | - | 0 |
| TMR-119 | Publish Maintenance Record with ***notes* value containing Hindu characters** | โลเร็ม อิปซัม | + | 0 |
| TMR-120 | Publish Maintenance Record with ***notes* value containing Arabic characters** | لوريم إيبسوم | + | 0 |
| TMR-121 | Publish Maintenance Record with ***notes* value containing Chinese characters** | 洛伦·伊普森 | + | 0 |
| TMR-122 | Publish Maintenance Record with ***notes* value as a HTML injection** | <marquee>Hacked</marquee> | + | 0 |
| TMR-122 | Publish Maintenance Record with ***notes* value as a XSS injection** | <script>alert(‘Hacked!’);</script> | + | 0 |
| TMR-123 | Publish Maintenance Record with ***notes* value as a SQL injection** | ' or 'A' = 'A | + | 0 |
| TMR-124 | Publish Maintenance Record **with no Tasks** | Publish Maintenance Record with id = 468 | - | 0 |
| TMR-125 | Publish Maintenance Record **with unpublished Tasks** | Publish Maintenance Record with id = 465 | - | 0 |
| TMR-126 | Publish Maintenance Record with **valid values** |  | + | 0 |
| TMR-127 | Publish Maintenance Record with **Different Technicians** | Publish MR with technician1 and technician2 | + | 0 |
| TMR-128 | Publish Maintenance Record **without a Technician Role / with Anonymous User** | /technician/maintenance-record/publish?id=465 with anonymous user | 500 – Access not authorised | 0 |
| TMR-129 | Publish Maintenance Record **created by another Technician** | /technician/maintenance-record/publish?id=465 with technician2 | 500 – Access not authorised | 0 |
| TMR-130 | Publish **published** Maintenance Record | /technician/maintenance-record/publish?id=490 | 500 – Access not authorised | 0 |
| TMR-131 | Publish **non-existing** Maintenance Record | /technician/maintenance-record/publish?id=999 | 500 – Access not authorised | 0 |
| TMR-132 | Publish Maintenance Record **with non-existing Technician** | Technician with id = -1 | Does not bind. | 0 |
| TMR-133 | Publish Maintenance Record **with Technician other than User** | Technician with id = 463 | Does not bind. | 0 |
| TMR-134 | Publish Maintenance Record **with invalid Aircraft** | Aircraft with id = 999 | 500 – Access not authorised | 0 |
|  | DELETE | | |  |
| TMR-135 | Delete Maintenance Record | Delete MR with id = 465 | + | 0 |
| TMR-136 | Delete Maintenance Record **without a Technician Role / with Anonymous User** | /technician/maintenance-record/delete?id=465 with anonymous user | 500 – Access not authorised | 0 |
| TMR-137 | Delete Maintenance Record **created by another Technician** | /technician/maintenance-record/delete?id=465 with technician2 | 500 – Access not authorised | 0 |
| TMR-138 | Delete **published** Maintenance Record | /technician/maintenance-record/delete?id=490 | 500 – Access not authorised | 0 |
| TMR-139 | Call Get method from Delete request **(access delete via URL)** | /technician/maintenance-record/delete?id=465 | 500 – Access not authorised | 0 |

### Task

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Id | Test Case | Input Value / Action Performed | Response | Bugs detected |
|  | LIST | | |  |
| TT-001 | List Tasks | /technician/task/list | + | 0 |
| TT-002 | List Tasks **without a Technician Role / with Anonymous User** | /technician/task/list with anonymous user | 500 – Access not authorised | 0 |
|  | LIST-MINE | | |  |
| TT-003 | List Logged Technician’s Tasks | /technician/task/list-mine with technician1 and technician3 | + | 0 |
| TT-004 | List Logged Technician’s Tasks **without a Technician Role / with Anonymous User** | /technician/task/list-mine with anonymous user | 500 – Access not authorised | 0 |
|  | SHOW | | |  |
| TT-005 | Show details of an **unpublished** Task with its Technician | /technician/task/show?id=493 | + | 0 |
| TT-006 | Show details of a **published** Maintenance Record | /technician/task/show?id=515 | + | 0 |
| TT-007 | Show details of a Maintenance Record **without a Technician Role / with Anonymous User** | /technician/task/show?id=493 with anonymous user | 500 – Access not authorised | 0 |
| TT-008 | Show details of an **unpublished** Maintenance Record **created by another Technician** | /technician/task/show?id=493 with technician2 | 500 – Access not authorised | 0 |
| TT-009 | Show details of a **non-existing** Maintenance Record | /technician/task/show?id=999 | 500 – Access not authorised | 0 |
|  | CREATE | | |  |
| TT-010 | Create Task with **Empty Fields** |  | - | 0 |
| TT-011 | Create Task with **“MAINTENANCE” *type*** | MAINTENANCE | + | 0 |
| TT-012 | Create Task with **“INSPECTION” *type*** | INSPECTION | + | 0 |
| TT-013 | Create Task with **“REPAIR” *type*** | REPAIR | + | 0 |
| TT-014 | Create Task with **“SYSTEM\_CHECK” *type*** | SYSTEM\_CHECK | + | 0 |
| TT-015 | Create Task with **minimum *description* value and minimum decrement (Min - Δ)** |  | - | 0 |
| TT-016 | Create Task with **minimum *description* value (Min)** | L | + | 0 |
| TT-017 | Create Task with **minimum *description* value and minimum increment (Min + Δ)** | Lo | + | 0 |
| TT-018 | Create Task with **maximum *description* value and minimum decrement (Max - Δ)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor | + | 0 |
| TT-019 | Create Task with **maximum *description* value (Max)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor\* | + | 0 |
| TT-020 | Create Task with **maximum *description* value and minimum increment (Max + Δ)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor i | - | 0 |
| TT-021 | Create Task with ***description* value containing Hindu characters** | โลเร็ม อิปซัม | + | 0 |
| TT-022 | Create Task with ***description* value containing Arabic characters** | لوريم إيبسوم | + | 0 |
| TT-023 | Create Task with ***description* value containing Chinese characters** | 洛伦·伊普森 | + | 0 |
| TT-024 | Create Task with ***description* value as a HTML injection** | <marquee>Hacked</marquee> | + | 0 |
| TT-025 | Create Task with ***description* value as a XSS injection** | <script>alert(‘Hacked!’);</script> | + | 0 |
| TT-026 | Create Task with ***description* value as a SQL injection** | ' or 'A' = 'A | + | 0 |
| TT-027 | Create Task with **minimum *priority* value and minimum decrement (Min - Δ)** | -1 | - | 0 |
| TT-028 | Create Task with **minimum *priority* value (Min)** | 0 | + | 0 |
| TT-029 | Create Task with **minimum *priority* value and minimum increment (Min + Δ)** | 1 | + | 0 |
| TT-030 | Create Task with **maximum *priority* value and minimum decrement (Max - Δ)** | 9 | + | 0 |
|  | Create Task with **maximum *priority* value (Max)** | 10 | + | 0 |
| TT-031 | Create Task with **maximum *priority* value and minimum increment (Max + Δ)** | 11 | - | 0 |
| TT-032 | Create Task with **minimum *estimatedDuration* value and minimum decrement (Min - Δ)** | -0.01 | - | 0 |
| TT-033 | Create Task with **minimum *estimatedDuration* value (Min)** | 0.00 | + | 0 |
| TT-034 | Create Task with **minimum *estimatedDuration* value and minimum increment (Min + Δ)** | 0.01 | + | 0 |
| TT-035 | Create Task with **maximum *estimatedDuration* value and minimum decrement (Max - Δ)** | 999.99 | + | 0 |
| TT-036 | Create Task with **maximum *estimatedDuration* value (Max)** | 1000.00 | + | 0 |
| TT-037 | Create Task with **maximum *estimatedDuration* value and minimum increment (Max + Δ)** | 1000.01 | - | 0 |
| TT-038 | Create Task with **valid values** |  | + | 0 |
| TT-039 | Create Task with **Different Technicians** | Create Task with technician1 and technician2 | + | 0 |
| TT-040 | Create Task **without a Technician Role / with Anonymous User** | /technician/task/create with anonymous user | 500 – Access not authorised | 0 |
| TT-041 | Create Task **with non-existing Technician** | Technician with id = -1 | Does not bind. | 0 |
| TT-042 | Create Task **with Technician other than User** | Technician with id = 463 | Does not bind. | 0 |
|  | UPDATE | | |  |
| TT-043 | Update Task with **Empty Fields** |  | - | 0 |
| TT-044 | Update Task with **“MAINTENANCE” *type*** | MAINTENANCE | + | 0 |
| TT-045 | Update Task with **“INSPECTION” *type*** | INSPECTION | + | 0 |
| TT-046 | Update Task with **“REPAIR” *type*** | REPAIR | + | 0 |
| TT-047 | Update Task with **“SYSTEM\_CHECK” *type*** | SYSTEM\_CHECK | + | 0 |
| TT-048 | Update Task with **minimum *description* value and minimum decrement (Min - Δ)** |  | - | 0 |
| TT-049 | Update Task with **minimum *description* value (Min)** | L | + | 0 |
| TT-050 | Update Task with **minimum *description* value and minimum increment (Min + Δ)** | Lo | + | 0 |
| TT-051 | Update Task with **maximum *description* value and minimum decrement (Max - Δ)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor | + | 0 |
| TT-052 | Update Task with **maximum *description* value (Max)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor\* | + | 0 |
| TT-053 | Update Task with **maximum *description* value and minimum increment (Max + Δ)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor i | - | 0 |
| TT-054 | Update Task with ***description* value containing Hindu characters** | โลเร็ม อิปซัม | + | 0 |
| TT-055 | Update Task with ***description* value containing Arabic characters** | لوريم إيبسوم | + | 0 |
| TT-056 | Update Task with ***description* value containing Chinese characters** | 洛伦·伊普森 | + | 0 |
| TT-057 | Update Task with ***description* value as a HTML injection** | <marquee>Hacked</marquee> | + | 0 |
| TT-058 | Update Task with ***description* value as a XSS injection** | <script>alert(‘Hacked!’);</script> | + | 0 |
| TT-059 | Update Task with ***description* value as a SQL injection** | ' or 'A' = 'A | + | 0 |
| TT-060 | Update Task with **minimum *priority* value and minimum decrement (Min - Δ)** | -1 | - | 0 |
| TT-061 | Update Task with **minimum *priority* value (Min)** | 0 | + | 0 |
| TT-062 | Update Task with **minimum *priority* value and minimum increment (Min + Δ)** | 1 | + | 0 |
| TT-063 | Update Task with **maximum *priority* value and minimum decrement (Max - Δ)** | 9 | + | 0 |
| TT-064 | Update Task with **maximum *priority* value (Max)** | 10 | + | 0 |
| TT-065 | Update Task with **maximum *priority* value and minimum increment (Max + Δ)** | 11 | - | 0 |
| TT-066 | Update Task with **minimum *estimatedDuration* value and minimum decrement (Min - Δ)** | -0.01 | - | 0 |
| TT-067 | Update Task with **minimum *estimatedDuration* value (Min)** | 0.00 | + | 0 |
| TT-068 | Update Task with **minimum *estimatedDuration* value and minimum increment (Min + Δ)** | 0.01 | + | 0 |
| TT-069 | Update Task with **maximum *estimatedDuration* value and minimum decrement (Max - Δ)** | 999.99 | + | 0 |
| TT-070 | Update Task with **maximum *estimatedDuration* value (Max)** | 1000.00 | + | 0 |
| TT-071 | Update Task with **maximum *estimatedDuration* value and minimum increment (Max + Δ)** | 1000.01 | - | 0 |
| TT-072 | Update Task with **valid values** |  | + | 0 |
| TT-073 | Update Task with **Different Technicians** | Update Task with technician1 and technician2 | + | 0 |
| TT-074 | Update Task **without a Technician Role / with Anonymous User** | /technician/task/update?id=493 with anonymous user | 500 – Access not authorised | 0 |
| TT-075 | Update Task **created by another Technician** | /technician/task/update?id=493 with technician2 | 500 – Access not authorised | 0 |
| TT-076 | Update **published** Task | /technician/task/update?id=515 | 500 – Access not authorised | 0 |
| TT-077 | Update **non-existing** Task | /technician/ task /update?id=999 | 500 – Access not authorised | 0 |
| TT-078 | Update Task **with non-existing Technician** | Technician with id = -1 | Does not bind. | 0 |
| TT-079 | Update Task **with Technician other than User** | Technician with id = 463 | Does not bind. | 0 |
|  | PUBLISH | | |  |
| TT-080 | Publish Task with **Empty Fields** |  | - | 0 |
| TT-081 | Publish Task with **“MAINTENANCE” *type*** | MAINTENANCE | + | 0 |
| TT-082 | Publish Task with **“INSPECTION” *type*** | INSPECTION | + | 0 |
| TT-083 | Publish Task with **“REPAIR” *type*** | REPAIR | + | 0 |
| TT-084 | Publish Task with **“SYSTEM\_CHECK” *type*** | SYSTEM\_CHECK | + | 0 |
| TT-085 | Publish Task with **minimum *description* value and minimum decrement (Min - Δ)** |  | - | 0 |
| TT-086 | Publish Task with **minimum *description* value (Min)** | L | + | 0 |
| TT-087 | Publish Task with **minimum *description* value and minimum increment (Min + Δ)** | Lo | + | 0 |
| TT-088 | Publish Task with **maximum *description* value and minimum decrement (Max - Δ)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor | + | 0 |
| TT-089 | Publish Task with **maximum *description* value (Max)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor\* | + | 0 |
| TT-090 | Publish Task with **maximum *description* value and minimum increment (Max + Δ)** | Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed do: eiusmod tempor incididunt ut labore et dolore magna aliqua! Ut enim ad minim veniam? Quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor i | - | 0 |
| TT-091 | Publish Task with ***description* value containing Hindu characters** | โลเร็ม อิปซัม | + | 0 |
| TT-092 | Publish Task with ***description* value containing Arabic characters** | لوريم إيبسوم | + | 0 |
| TT-093 | Publish Task with ***description* value containing Chinese characters** | 洛伦·伊普森 | + | 0 |
| TT-094 | Publish Task with ***description* value as a HTML injection** | <marquee>Hacked</marquee> | + | 0 |
| TT-095 | Publish Task with ***description* value as a XSS injection** | <script>alert(‘Hacked!’);</script> | + | 0 |
| TT-096 | Publish Task with ***description* value as a SQL injection** | ' or 'A' = 'A | + | 0 |
| TT-097 | Publish Task with **minimum *priority* value and minimum decrement (Min - Δ)** | -1 | - | 0 |
| TT-098 | Publish Task with **minimum *priority* value (Min)** | 0 | + | 0 |
| TT-099 | Publish Task with **minimum *priority* value and minimum increment (Min + Δ)** | 1 | + | 0 |
| TT-100 | Publish Task with **maximum *priority* value and minimum decrement (Max - Δ)** | 9 | + | 0 |
| TT-101 | Publish Task with **maximum *priority* value (Max)** | 10 | + | 0 |
| TT-102 | Publish Task with **maximum *priority* value and minimum increment (Max + Δ)** | 11 | - | 0 |
| TT-103 | Publish Task with **minimum *estimatedDuration* value and minimum decrement (Min - Δ)** | -0.01 | - | 0 |
| TT-104 | Publish Task with **minimum *estimatedDuration* value (Min)** | 0.00 | + | 0 |
| TT-105 | Publish Task with **minimum *estimatedDuration* value and minimum increment (Min + Δ)** | 0.01 | + | 0 |
| TT-106 | Publish Task with **maximum *estimatedDuration* value and minimum decrement (Max - Δ)** | 999.99 | + | 0 |
| TT-107 | Publish Task with **maximum *estimatedDuration* value (Max)** | 1000.00 | + | 0 |
| TT-108 | Publish Task with **maximum *estimatedDuration* value and minimum increment (Max + Δ)** | 1000.01 | - | 0 |
| TT-109 | Publish Task with **valid values** |  | + | 0 |
| TT-110 | Publish Task with **Different Technicians** | Publish Task with technician1 and technician2 | + | 0 |
| TT-111 | Publish Task **without a Technician Role / with Anonymous User** | /technician/task/publish?id=493 with anonymous user | 500 – Access not authorised | 0 |
| TT-112 | Publish Task **created by another Technician** | /technician/task/publish?id=493 with technician2 | 500 – Access not authorised | 0 |
| TT-113 | Update **published** Task | /technician/task/publish?id=515 | 500 – Access not authorised | 0 |
| TT-114 | Update **non-existing** Task | /technician/ task /publish?id=999 | 500 – Access not authorised | 0 |
| TT-115 | Update Task **with non-existing Technician** | Technician with id = -1 | Does not bind. | 0 |
| TT-116 | Update Task **with Technician other than User** | Technician with id = 463 | Does not bind. | 0 |
|  | DELETE | | |  |
| TT-117 | Delete Task |  | + | 0 |
| TT-118 | Delete Task **without a Technician Role / with Anonymous User** | /technician/task/delete?id=493 | 500 – Access not authorised | 0 |
| TT-119 | Delete Task **created by another Technician** | /technician/task/delete?id=493 with technician2 | 500 – Access not authorised | 0 |
| TT-120 | Delete **published** Task | /technician/task/delete?id=515 | 500 – Access not authorised | 0 |
| TT-121 | Call Get method from Delete request **(access delete via URL)** | /technician/task/delete?id=493 | 500 – Access not authorised | 0 |

### Involved In

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Id | Test Case | Input Value | Response |  |
|  | LIST | | |  |
| TII-001 | List Tasks from **published** Maintenance Record | /technician/involved-in/list?masterId=471 with technician1 and technician2 | + | 0 |
| TII-002 | List Tasks from **unpublished** Maintenance Record **created by logged Technician** | /technician/involved-in/list?masterId=465 | + | 0 |
| TII-003 | List Tasks from Maintenance Record **without a Technician Role / with Anonymous User** | /technician/involved-in/list?masterId=465 with anonymous user | 500 – Access not authorised | 0 |
| TII-004 | List Tasks from **non-existing** Maintenance Record | /technician/involved-in/list?masterId=999 | 500 – Access not authorised | 0 |
| TII-005 | List Tasks from **unpublished** Maintenance Record **created by another Technician** | /technician/involved-in/list?masterId=465 with technician2 | 500 – Access not authorised | 0 |
|  | SHOW | | |  |
| TII-006 | Show details of a Task from **published** Maintenance Record | /technician/involved-in/show?id=523 with technician1 and technician2 | + | 0 |
| TII-007 | Show details of a Task from **unpublished** Maintenance Record **created by logged Technician** | /technician/involved-in/show?id=517 | + | 0 |
| TII-008 | Show details of a Task from Maintenance Record **without a Technician Role / with Anonymous User** | /technician/involved-in/show?id=517 with anonymous user | 500 – Access not authorised | 0 |
| TII-009 | Show details of a Task from **unpublished** Maintenance Record **created by another Technician** | /technician/involved-in/show?id=517 with technician2 | 500 – Access not authorised | 0 |
| TII-010 | Show details of a **non-existing** Task involved in Maintenance Record | /technician/involved-in/show?id=999 | 500 – Access not authorised | 0 |
|  | CREATE | | |  |
| TII-011 | Add Task to Maintenance Record with **Empty Fields (no Task selected)** |  | - | 0 |
| TII-012 | Add **published** Task to Maintenance Record | Add Task with id = 515 to Maintenance Record with id = 465 | + | 0 |
| TII-013 | Add **unpublished** Task **created by logged Technician** to Maintenance Record | Add Task with id = 496 to Maintenance Record with id = 465 | + | 0 |
| TII-014 | Add Task to Maintenance Record **without a Technician Role / with Anonymous User** | /technician/involved-in/create?masterId=465 | 500 – Access not authorised | 0 |
| TII-015 | Add Task to **unpublished** Maintenance Record **created by another Technician** | /technician/involved-in/create?masterId=465 with technician2 | 500 – Access not authorised | 0 |
| TII-016 | Add Task to **non-existing** Maintenance Record | /technician/involved-in/create?masterId=999 | 500 – Access not authorised | 0 |
| TII-017 | Add Task to **published** Maintenance Record | /technician/involved-in/create?masterId=490 | 500 – Access not authorised | 0 |
| TII-018 | Add **non-existing** Task to Maintenance Record | Add Task with id = 999 to Maintenance Record with id = 465 | 500 – Access not authorized | 0 |
| TII-019 | Add **unpublished** Task **created by another Technician** to Maintenance Record | Add Task with id = 516 to Maintenance Record with id = 465 | 500 – Access not authorized | 0 |
| TII-020 | Add **duplicated** Task to Maintenance Record **(task already involved in Maintenance Record)** | Add Task with id = 493 to Maintenance Record 465 | 500 – Access not authorised | 0 |
|  | DELETE | | |  |
| TII-021 | Remove Task from Maintenance Record |  | + | 0 |
| TII-022 | Remove Task from Maintenance Record **without a Technician Role / with Anonymous User** | /technician/involved-in/delete?id=517 with anonymous user | 500 – Access not authorised | 0 |
| TII-023 | Remove Task from Maintenance Record **created by another Technician** | Delete Involved In with id = 517 with technician2 | 500 – Access not authorised | 0 |
| TII-024 | Remove **non-existing** Task from Maintenance Record | Delete Involved In with id = 999 | 500 – Access not authorised | 0 |
| TII-025 | Remove Task from **published** Maintenance Record | Delete Involved In with id = 523 | 500 – Access not authorised | 0 |
| TII-026 | Call Get method from Delete request **(access delete via URL)** | /technician/involved-in/delete?id=517 | 500 – Access not authorised | 0 |

Since every test case was considered and documented along with its inputs and actions before recording the tests, no bugs where found. Therefore, these test suites effectiveness were low.

## Coverage

Regarding lines of code executed when performing tests, the test suites reveal the following when *replay* is played on the technician ones:

|  |  |
| --- | --- |
| Element | Coverage |
| **Technician: Involved In** | **99.8%** |
| TechnicianInvolvedInDeleteService.java | 98.8% |
| TechnicianInvolvedInController.java | 100% |
| TechnicianInvolvedInCreateService.java | 100% |
| TechnicianInvolvedInListService.java | 100% |
| TechnicianInvolvedInShowService.java | 100% |
| **Technician: Maintenance Record** | **99.9%** |
| TechnicianMaintenanceRecordDeleteService.java | 98.9% |
| TechnicianMaintenanceRecordController.java | 100% |
| TechnicianMaintenanceRecordCreateService.java | 100% |
| TechnicianMaintenanceRecordListMineService.java | 100% |
| TechnicianMaintenanceRecordListService.java | 100% |
| TechnicianMaintenanceRecordPublishService.java | 100% |
| TechnicianMaintenanceRecordShowService.java | 100% |
| TechnicianMaintenanceRecordUpdateService.java | 100% |
| **Technician: Task** | **99.9%** |
| TechnicianTaskDeleteService.java | 98.9% |
| TechnicianTaskController.java | 100% |
| TechnicianTaskCreateService.java | 100% |
| TechnicianTaskListMineService.java | 100% |
| TechnicianTaskListService.java | 100% |
| TechnicianTaskPublishService.java | 100% |
| TechnicianTaskShowService.java | 100% |
| TechnicianTaskUpdateService.java | 100% |

A screenshot of a computer

AI-generated content may be incorrect.

It can be observed that every class has a 100% coverage rate except for those that implement a delete service, being these: *TechnicianInvolvedInDeleteService.java*, *TechnicianMaintenanceRecordDeleteService.java* and *TechnicianTaskDeleteService.java*, each of them having 1 line that is not covered.

This happens because, whenever any of these services are called, the *authorise* function checks if the method is “GET”. Since this method is not allowed (there is no button that redirects to that URL nor any validation happens), an “Access not authorized” exception is sent, which prevents the *unbind* method from executing (the lines that is not covered), resulting in a function that cannot be accessed whatsoever.

## Performance

To evaluate the system's performance, tests were carried out on two different computers (referred to as PC A and PC B). The objective was to assess how the execution time varied depending on the hardware used, and to statistically compare their performance. From these tests, descriptive statistics were gathered, such as mean execution time, standard deviation, skewness, and kurtosis. Additionally, a hypothesis test was performed to determine whether the difference in mean execution time between the two PCs was statistically significant.

### PC A Performance

To start with, a *tester.trace* file was obtained for technician tests, which were imported into Excel to obtain statistics, ending up with the following:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *PC A* | | | | | |
|  |  |  |  |  |  |
| Mean | 6,372329 |  | Skewness | | 3,08167 |
| Standard Error | 0,247249 |  | Range | | 75,4341 |
| Median | 3,0736 |  | Minimum | | 0,9344 |
| Mode | 1,2893 |  | Maximum | | 76,3685 |
| Standard Deviation | 7,552227 |  | Sum | | 5945,383 |
| Sample Variance | 57,03613 |  | Count | | 933 |
| Kurtosis | 16,10717 |  | Confidence Level(95,0%) | | 0,485229 |

|  |  |  |
| --- | --- | --- |
| Interval (ms) | 5,89 | 6,857558 |
| Interval (s) | 0,01 | 0,006858 |

The statistical analysis for PC A shows an average execution time of 6.37 ms, with a relatively high standard deviation of 7.55 ms. The 95% confidence interval for the mean execution time ranges from 5.89 ms to 6.86 ms.

Moreover, specific services can be seen to have worse performance than the rest, highlighting those that create or update an entity, for example, the create service for the involved in entity or the publish service for maintenance records.

### PC B Performance

In order to compare PC A with PC B, the same statistics were gathered:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *PC B* | | | | | |
|  |  |  |  |  |  |
| Mean | 5,131727 |  | Skewness | | 2,701227 |
| Standard Error | 0,185034 |  | Range | | 60,0112 |
| Median | 2,3474 |  | Minimum | | 0,601 |
| Mode | 1,0721 |  | Maximum | | 60,6122 |
| Standard Deviation | 5,651887 |  | Sum | | 4787,901 |
| Sample Variance | 31,94383 |  | Count | | 933 |
| Kurtosis | 14,65864 |  | Confidence Level(95,0%) | | 0,363133 |

|  |  |  |
| --- | --- | --- |
| Interval (ms) | 4,768594 | 5,494859 |
| Interval (s) | 0,004769 | 0,005495 |

The statistical analysis for PC A shows an average execution time of 5.13 ms, with a relatively high standard deviation of 5.65 ms. The 95% confidence interval for the mean execution time ranges from 4.76 ms to 5.49 ms.

Just like for PC A, specific services have the worst performance, being those, again, those that create or update an entity.

### Performance Comparison

|  |  |  |
| --- | --- | --- |
|  | *PC A* | *PC B* |
| Mean | 6,372229 | 5,131645 |
| Known Variance | 5703613 | 3194383 |
| Observations | 934 | 934 |
| Hypothesized Mean Difference | 0 |  |
| z | 0,01271 |  |
| P(Z<=z) one-tail | 0,494929 |  |
| z Critical one-tail | 1,644854 |  |
| P(Z<=z) two-tail | 0,989859 |  |
| z Critical two-tail | 1,959964 |  |

To determine whether the difference in mean execution times between the two PCs is statistically significant, a two-tailed Z-test was conducted. The most significan result is P(Z<=z) two-tail = 0,989859.

Since the p-value (0.9899) is significantly greater than the common significance level (α = 0.05), the null hypothesis cannot be rejected. This indicates that the difference in mean execution time between the two PCs is not statistically significant, even though PC B has a slightly lower average.

Analyzing the rest of statistics, they reveal several key differences. PC A has a higher mean execution time, indicating that PC A generally takes longer to complete tasks. This is supported by higher values for both the median and mode in PC A, suggesting consistently slower performance relative to PC B.

### Performance Conclusion

Although PC B demonstrates marginally better performance in terms of average execution time and consistency (lower variability), this difference is not statistically significant. Therefore, it can be concluded that both PCs offer comparable performance for the evaluated system, with PC B having a small advantage.

# Conclusions

The testing process was divided into functional and performance analyses.

In the functional testing chapter, over one hundred test cases were designed and executed across multiple features. All test cases were run successfully, and while no bugs were detected, this outcome likely reflects high implementation correctness rather than low test quality. The test suites achieved nearly full code coverage, especially in controller and service classes. Only a few lines in delete services remained uncovered due to unreachable conditions during authorized flows.

In the performance testing chapter, the wall times of the same test suite were collected on two different machines (PC A and PC B). Statistical analysis included descriptive statistics and 95% confidence intervals for response times, as well as a two-tailed hypothesis test. Although PC B exhibited a slightly faster average response time, the hypothesis test confirmed that this difference is not statistically significant at the 95% confidence level.

In conclusion, the system is functionally complete and performs reliably across diverse hardware setups. While PC B shows a marginal practical edge in speed and consistency, both systems support stable execution of the software under test.

# Bibliography

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