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| **API Gateway** |
| UAT/Staging Performance Test Report |

**Version 2.0**

**16 Feb 2022**

Prepared By:



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**Performance Testing Acceptance**

I/We hereby verify that this Performance Testing Acceptance Document consist of all the information requested by AgroBank.

I/We also hereby AGREE that this satisfies our entire performance test result for API services in UAT environment.

**AgroBank:**

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| **Approved by** | **Role** | **Signature** | **Date** |
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| Gabbytian Rayvandy | Project Manager |  | 16-Feb-2022 |

Document Management

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| 1.0 | 12/08/2021 | Initial Release | Siti Balqis  Software Engineer | Gabbytian Rayvandy  Project Manager |
| 2.0 | 16/02/2022 | Added a new topic  3.4. Result of Load test after implemented the solution | Siti Balqis  Software Engineer | Gabbytian Rayvandy  Project Manager |

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Chapter 1 - Introduction

### Background The JMeter testing for API Gateway was conducted to address about bank’s concern about certain issues happened in year 2021 such as API Gateway unable to start in IB server, maximum web container reached, and database deadlock.

### Purpose

The purpose of this document is to provide investigation and solution for the API Gateway issues reported by the bank and performance results before and after performance tweaking.

Chapter 2 - Content

### Execution Strategy

* 1. **Type of testing: Load Testing**

A load test is a planned test to perform a specified number of requests to a system in order to test the query to DB under specific levels of simultaneous requests. A load test ensures that API is capable of handling an expected volume of traffic, and therefore is sometimes referred to as volume testing.

The goal of this load test is to prove that with new JDBC setting can handle the expected volume with minimal acceptable performance degradation. In this test scenario, we simulated the maximum number of request with the goal of less than 1% of errors. Others than that, to check the performance test on the JNDI setting.

* 1. **Methods of Testing**

Penril conducted load testing to the selected API services mentioned below based on production issue log on 03 September 2021.

|  |  |  |  |
| --- | --- | --- | --- |
| **System** | **Function** | **Module** | **Test Case** |
| **API** | Retrieve Security Image | getSecurityImage API |  |
| Verify user login | getLogin API |  |

* 1. **Process of testing**

Refer below items for the detailed process:

1. **Retrieve Security Image (getSecurityImage)**

This test scenario simulates concurrent users view security Image screen and username

1. **CUA DB Schema**

**-** Retrieve data to verify the requested header and data to decrypt the passing username request

1. **IB DB Schema**

- Retrieve user security image based on user id

Involved table “IB\_USER”,”IB\_CUST\_PROFILE”, and “IB\_USER\_SECURITY”.

- This is for MB to display the user security image and username at front en screen

1. **Verify user login (getLogin API)**

In this stage, the API call upass to verify user login based on username and password.

1. **CUA DB Schema**

- Retrieve data to verify the requested header and data to decrypt the passing username and password request

- Verify user authentication

1. **IB DB Schema**

- Retrieve user information based on user id to check on the user status

Involved table “IB\_USER”,and ”IB\_CUST\_PROFILE”.

### Performance Test Environment

|  |  |  |
| --- | --- | --- |
| **Test Region** | **:** | UAT Preprod Environment |
| **Instance Testing** | **:** | API - UAT Preprod Environment  <https://172.16.49.2:9081/agro-api-gateway-rest-uat-techref/ibLoginServices/getSecurityImagePhrase>  [https://172.16.49.2:9081/agro-api-gateway-rest-uat-techref/ibLoginServices/getLogin](https://172.16.49.2:9081/agro-api-gateway-rest-uat-techref/ibLoginServices/getSecurityImagePhrase)  API - Deadlock solution  <https://172.16.49.2:9081/agro-api-gateway-uat-deadlock/ibLoginServices/getSecurityImagePhrase>  <https://172.16.49.2:9081/agro-api-gateway-uat-deadlock/ibLoginServices/getLogin> |
| **Apache JMeter Version** | **:** | Version 5.1.1 r1855137 |
| **Java Version** | **:** | JDK 1.8 |

### Test Scenario & Test Result with Explanation in Layman Terms

#### Load test on the new JDBC configuration setting

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| **Item** | **Min Connection pool** | **Max Connection pool** |
| Original JDBC setting | 0 | Up to 100 |
| New JDBC setting | 0 | 24 |

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| **Scenario 1** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Execution Time | 6.40 PM - | | Min pool connection: | 0 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 1 Second | | Loop: | Infinite loop for 5 minutes | | Complete Execution time: | 5 Minutes and 1 seconds |     **Test Result**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Error | | | HTTP Error | JDBC Error | | getLogin API | 2435 | 8.1/Sec | 0% | 0% | | getSecurityImage API | 2985 | 9.9/Sec | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurity Token** | | |

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| **Scenario 2** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Execution Time | 08.14 PM - | | Min pool connection: | 0 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 1 Second | | Loop: | Infinite loop for 1 hour | | Complete Execution time: | 1 hour and 36 seconds |     **Test Result**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Error | | | HTTP Error | JDBC Error | | getLogin API | 33170 | 9.1/Sec | 0% | 0% | | getSecurityImage API | 39906 | 11.0/Sec | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurityImage** | | |

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| **Scenario 3** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Execution Time | 08.14 PM - | | Min pool connection: | 0 | | Max pool connection: | 24 | | No of Thread/User: | 75 | | Ramp-up | 1 Second | | Loop: | Infinite loop for 2 hours | | Complete Execution time: | 2 hours and 2 seconds |     **Test Result**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Error | | | HTTP Error | JDBC Error | | getLogin API | 62806 | 8.7/Sec | 0% | 0% | | getSecurityImage API | 71715 | 10.0/Sec | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurityImage** | | |

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| **Scenario 4** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Execution Date | 10/09/2021 - 12/09/2021 | | Execution Time | 08.31 PM - | | Min pool connection: | 0 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 1 Second | | Loop: | Infinite loop | | Complete Execution time: | 48 hours 39 minutes and 26 seconds |     **Test Result**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Error | | | HTTP Error | JDBC Error | | getLogin API | 2675886 | 15.3/Sec | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin** | | |

#### Load test on the JNDI configuration setting. Increase the Max connection pool

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| **Item** | **Min Connection pool** | **Max Connection pool** |
| Original JNDI setting | 0 | 10 |
| New JNDI setting | 0 | 24 |

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| **Scenario 1** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 09/09/2021 | | Execution Time | 02.11 PM - | | Min pool connection: | 0 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 1 Second | | Loop: | Infinite loop for 5 minutes | | Complete Execution time: | 5 Minutes |     **Test Result**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Success | Error | | | HTTP Error | JDBC Error | | getLogin API | 1004 | 4.88/Sec | 955 | 0% | 4.88% | | getSecurityImage API | 63247 | 210.3/Sec | 63247 | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurityImage** | | |

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| **Scenario 2** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 09/09/2021 | | Execution Time | 03.08 PM - | | Min pool connection: | 0 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 10 Second | | Loop: | Infinite loop for 5 minutes | | Complete Execution time: | 5 Minutes |     **Test Result**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Success | Error | | | HTTP Error | JDBC Error | | getLogin API | 1009 | 3.7/Sec | 964 | 0% | 4.46% | | getSecurityImage API | 61986 | 206.5/Sec | 61986 | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurityImage** | | |

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| **Scenario 3** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 09/09/2021 | | Execution Time |  | | Min pool connection: | 0 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 20 Second | | Loop: | Infinite loop for 5 minutes | | Complete Execution time: | 5 Minutes |     **Test Result**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Success | Error | | | HTTP Error | JDBC Error | | getLogin API | 1463 | 4.9/Sec | 1414 | 0% | 3.35% | | getSecurityImage API | 66224 | 220.3/Sec | 66224 | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurityImage** | | |

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| **Scenario 4** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 09/09/2021 | | Execution Time | 6.51 PM | | Min pool connection: | 0 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 30 Second | | Loop: | Infinite loop for 5 minutes | | Complete Execution time: | 5 Minutes |     **Test Result**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Success | Error | | | HTTP Error | JDBC Error | | getLogin API | 1332 | 4.4/Sec | 1283 | 0% | 3.68% | | getSecurityImage API | 60991 | 203.0/Sec | 60991 | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurityImage** | | |

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| **Scenario 5** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 09/09/2021 | | Execution Time | 7.05 PM | | Min pool connection: | 0 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 40 Second | | Loop: | Infinite loop for 5 minutes | | Complete Execution time: | 5 Minutes |     **Test Result**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Success | Error | | | HTTP Error | JDBC Error | | getLogin API | 1319 | 4.4/Sec | 1270 | 0% | 3.71% | | getSecurityImage API | 51464 | 171.3/Sec | 51464 | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurityImage** | | |

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| **Scenario 6** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 09/09/2021 | | Execution Time | 8.21 PM | | Min pool connection: | 0 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 50 Seconds | | Loop: | Infinite loop for 5 minutes | | Complete Execution time: | 5 Minutes |     **Test Result**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Success | Error | | | HTTP Error | JDBC Error | | getLogin API | 1163 | 3.9/Sec | 1114 | 0% | 4.21% | | getSecurityImage API | 59321 | 197.5/Sec | 59321 | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurityImage** | | |

#### Load test on the JNDI configuration setting - Increase the Min Connection pool

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|  | **Item** | **Min Connection pool** | **Max Connection pool** |
| CUA | Original JNDI setting | 0 | 10 |
| New JNDI setting | 5 | 24 |
| API Gateway | JNDI setting | 0 | 10 |

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| **Scenario 1** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 09/09/2021 | | Execution Time | 09.14 PM - | | Min pool connection: | 5 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 50 Second | | Loop: | 1 | | Complete Execution time: | 48 Seconds |     **Test Result**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Error | | | HTTP Error | JDBC Error | | getLogin API | 50 | 1.0/Sec | 0% | 0% | | getSecurityImage API | 50 | 1.0/Sec | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurityImage** | | |

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| **Scenario 2** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 09/09/2021 | | Execution Time | 09.25 PM - | | Min pool connection: | 5 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 20 Seconds | | Loop: | Infinite loop in 5 minutes | | Complete Execution time: | 5 minutes |     **Test Result**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Success | Error | | | HTTP Error | JDBC Error | | getLogin API | 844 | 2.8/Sec | 795 | 0% | 5.81% | | getSecurityImage API | 62198 | 206.8/Sec | 62198 | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurityImage** | | |

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| **Scenario 3** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 09/09/2021 | | Execution Time | 09.40 PM - | | Min pool connection: | 5 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 30 Seconds | | Loop: | Infinite loop in 5 minutes | | Complete Execution time: | 5 minutes |     **Test Result**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Success | Error | | | HTTP Error | JDBC Error | | getLogin API | 1214 | 4.0/Sec | 1165 | 0% | 4.04% | | getSecurityImage API | 61548 | 204.9/Sec | 61548 | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurityImage** | | |

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| **Scenario 4** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 09/09/2021 | | Execution Time | 10.18 PM - | | Min pool connection: | 5 | | Max pool connection: | 24 | | No of Thread/User: | 30 | | Ramp-up | 20 Seconds | | Loop: | Infinite loop in 5 minutes | | Complete Execution time: | 5 minutes |     **Test Result**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Success | Error | | | HTTP Error | JDBC Error | | getLogin API | 1137 | 3.8/Sec | 1108 | 0% | 2.55% | | getSecurityImage API | 63163 | 210.1/Sec | 63163 | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report**  **getLogin**    **getSecurityImage** | | |

* 1. **Result of Load test after implemented the solution**

**Implemented Solution :**

1. Dead Lock/Long Query Fix (IB\_CUST\_PROFILE)
2. Convert update query to native query for below functions;
   1. Update last login date, (TB\_AM\_USER)
   2. Update session to store, (TB\_AM\_SESSION)
   3. Update Password to store (TB\_AM\_PASSWORD)

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| --- | --- | --- | --- |
|  | **Item** | **Min Connection pool** | **Max Connection pool** |
| CUA | Original JNDI setting | 0 | 10 |
| New JNDI setting | 10 | 24 |
| API GATEW | JNDI setting | 0 | 10 |

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| **Scenario 1** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 16/02/2022 | | Execution Time |  | | Min pool connection: | 10 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 50 Second | | Loop: | 1 | | Complete Execution time: | 49 Seconds |     **Test Result**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Error | | | HTTP Error | JDBC Error | | getSecurityImage API | 50 | 1.0/Sec | 0% | 0% | | getLogin API | 50 | 1.0/Sec | 0% | 0% | | Total | 100 | 2.0/Sec |  |  |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report** | | |

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| **Scenario 2** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 16/02/2022 | | Execution Time |  | | Min pool connection: | 10 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 20 Seconds | | Loop: | Infinite loop in 5 minutes | | Complete Execution time: | 5 minutes |     **Test Result**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Error | | | HTTP Error | JDBC Error | | getSecurityImage API | 2964 | 9.8/Sec | 0% | 0% | | getLogin API | 2985 | 9.9/Sec | 0% | 0% | | Total | 5949 | 19.7/Sec | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report** | | |

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| **Scenario 3** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 16/02/2022 | | Execution Time |  | | Min pool connection: | 10 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 30 Seconds | | Loop: | Infinite loop in 5 minutes | | Complete Execution time: | 5 minutes |     **Test Result**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Error | | | HTTP Error | JDBC Error | | getSecurityImage API | 2959 | 9.8/Sec | 0% | 0% | | getLogin API | 2936 | 9.7/Sec | 0% | 0% | | Total | 5895 | 19.5/Sec | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report** | | |

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| **Scenario 4** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 16/02/2022 | | Execution Time |  | | Min pool connection: | 10 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 10 Seconds | | Loop: | Infinite loop in 5 minutes | | Complete Execution time: | 5 minutes |     **Test Result**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Error | | | HTTP Error | JDBC Error | | getSecurityImage API | 2990 | 9.9/Sec | 0% | 0% | | getLogin API | 2968 | 9.8/Sec | 0% | 0% | | Total | 5958 | 19.7/Sec | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report** | | |

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| **Scenario 5** |  |  |
| **Test Criteria:**   |  |  | | --- | --- | | Date Execution | 16/02/2022 | | Execution Time |  | | Min pool connection: | 10 | | Max pool connection: | 24 | | No of Thread/User: | 50 | | Ramp-up | 1 Seconds | | Loop: | Infinite loop in 5 minutes | | Complete Execution time: | 5 minutes |     **Test Result**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Test Item | No HTTP Request | TPS (Transaction per second) | Error | | | HTTP Error | JDBC Error | | getSecurityImage API | 2955 | 9.8/Sec | 0% | 0% | | getLogin API | 2933 | 9.7/Sec | 0% | 0% | | Total | 5888 | 19.5/Sec | 0% | 0% |   **Remarks** | | |
| **Screen shot of the JMeter Summary Report** | | |

Chapter 3 - Conclusion

### Final Conclusion

Before we made any tweaking or changes to both API Gateway and CUA there were error found in JMeter caused by database deadlock during login with 50 concurrent user login.

So, we perform tweaking by converting “hibernate” to “SQL native query” which is the faster way to fetch data from table.

After, perform the tweaking at API Gateway, the performance is much better. However, faster processing time in API Gateway causing deadlock issue in CUA. So, we have implemented similar tweaking at CUA.

The result is positive whereby there is no error happened at both API Gateway and CUA. This detail can be found in Chapter 2.

### Recommendation

We recommended increasing the JNDI connection pool to cater to new tweaking. This detail can be found in Chapter 2.