Electronic Replacement

Performance Test Closure Report

Version 1.0

Maveric Systems

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Revision History

Author	Date	Version	Comments
Vimal Raj	26-Jan-22	0.1	Baseline version
Vimal Raj	27-Jan-22	1.0	Updated Management Summary

Approved By

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1. Background

Bank Muscat (hereafter referred as BM) wishes to develop a new age centralized solution that would reduce the overall operational processes of finance, Cash Management, Locker, Asalah and Najahi and automatically maintain records for all modules in this new solution. In this process, Bank Muscat has planned for Performance testing all the modules of the Electronic Replacement Application. In line to the requirements & expectations of BM IT Management, Maveric has extended their Non-functional testing (Performance testing) service to simulate the test scenarios and measure the key performance indicators for various load conditions.

1. Performance Test Objective

The objective and scope of the performance testing are provided below

Objective	Status
To Measure the End to End response time while handling 190 concurrent user load across all modules of Electronic Replacement application	
To measure the performance of the Electronic Replacement application while handling 50% user load for a prolonged duration of 6 hours	
To measure the performance of the Electronic Replacement application under stress condition and to determine the breakpoint of the application in UAT environment	
To monitor the server metrics not limited to CPU, Memory, Disk I/O & Network during execution and ensure the resources utilization are under threshold limits of 75%.	

2. Management Summary

- Electronic Replacement application were performance tested for the derived peak concurrent user load of 190 users and peak hour volume of 6328 transactions were able to handle 100% of 2024 concurrent user load with 98.2% of the transactions response time under SLA and achieved 99% of expected volume (Achieved: 6246 transactions | Expected: 6328 transactions)
- Endurance test were performed for a duration of 6 hours with 96.26% transactions had response time below SLA and 100% of expected volume were achieved. No memory related issues were observed for the period of the run (Achieved: 19039 transactions | Expected: 19046 transactions)
- Observed the breakpoint of the application during the ramp-up stage on increasing the concurrent users from 236 and above by keeping the ramp up time as all 320 user in 10 minutes. However, the application was able to handle almost twice the peak volume of 2024 volume in one hour with a maximum user concurrency of 319 users in the application which consumed 100% of CPU in Web server and a peak of 100 % of CPU in Database server during the run

- Resource utilization were observed under acceptable threshold (<75%) in terms of CPU & memory for both Load and Endurance execution
- During the 30% standalone Load Test Execution for Cash Management requested application team to remove the duplicate request in the same user actions and to enable the caching mechanism in the application which reduced the application response times significantly, whereby limiting the number of hits to server by 27.56% (72.43% were cached and not sent to server)
- Query indexing and optimization were provided by the application team to reduce the DB response times which in turn reduced the front end response times for submit transactions
- ESB Token validation service was triggered each time when a service was triggered which was changed to once in 24 hours, whereby reducing the response times in Safe Locker transactions

3. Performance Test Scope

3.1. Transaction in Scope

The below mentioned are the transactions finalized for the performance testing of Electronic Replacement application,

- Cash Management
  - ATM Cash Balancing Details
  - ATM Ledger Balancing Details
  - CDM Cash & Ledger Balancing Details
  - Cash Request Details
  - Surprise Check Details
- Asalah
  - Create Prospects
  - Create Calls
  - Create Deals
- Najahi
  - Create Prospects
  - Create Calls
  - Create Deals
- Safe Locker
  - Assign Locker

3.2. Out of Scope

- Transactions apart from the agreed profile/modules in iShare were not performance tested
- Performance execution will not cover any testing types other than agreed scope (Load /Volume & Breakpoint and Endurance). Also, any metrics related to UI of Electronic Replacement application

- Any form of functional testing including field level validations, systems testing & integration testing are not in scope
- Client-side encryption, Email / SMS alerts, OTP and any other security level challenges were not simulated as part of performance testing
- Application integration with ROP was not in scope for Performance Testing
- Batch processing to validate the debited amount is credited in T24 account processing were not in scope

4. Performance Test Execution

The below mentioned are the Performance test execution scenarios executed to measure the Electronic Replacement application.

4.1. Performance Test Scenarios and Status

Test Round	Load Scenario	Actual Date	Response Time	Volume Achieved	RAG	Comments
Round 1 Cycle 1	100% Combined Load Test	12-Jan-2022	88.9% < SLA	99%		▶ Out of 54 user action/pages, 6 user action were not under agreed SLA (88.88% of under SLA of 5 sec) ▶ 6246 successful E2E Transactions were achieved during the test run wherein the expected volume was 6302 transactions (99% of volume achieved)
Round 1 Cycle 2	100% Combined Load Test	19-Jan-2022	98.1% < SLA	99%		▶ Out of 54 user action/pages, only 1 user action were not under agreed SLA (98.14% of under SLA of 5 sec) ▶ 6246 successful E2E Transactions were achieved during the test run wherein the expected volume was 6308 transactions (99% of volume achieved)
Round 2 Cycle 1	Breakpoint Test	23-Jan-2022	0.1%<SLA	87%		▶ Out of 54 user action/pages, only 5 user action were under agreed SLA (0.1% of under SLA of 5 sec)- Refer Sub Transaction Summary

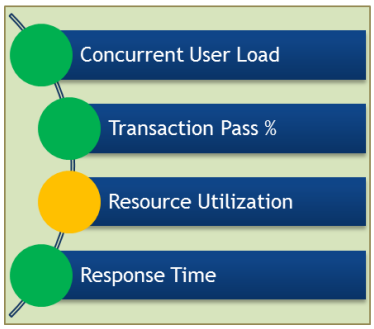
						▶ Average response times for all the touch points were within the agreed SLA for the first 7 minutes, post increasing the user concurrency to 236 the response times increased exponentially ▶ 16102 successful E2E Transactions were achieved during the test run wherein the expected volume for 100% Load test was 6308 transactions (198% of 100% volume achieved)
Round 3 Cycle 1	Endurance Test	23-Jan-2022	96.3%<SLA	100%		▶ Out of 54 user action/pages, 2 user action were not under agreed SLA (96.26% of under SLA of 5 sec) ▶ 19039 successful E2E Transactions were achieved during the test run wherein the expected volume was 19046 transactions (100% of volume achieved)

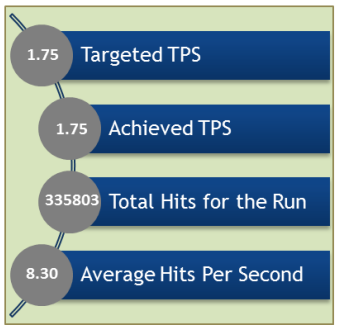
Note: The above RAG (Red, Amber & Green) status are denoted based on the test results, the major counters that were taken into consideration are Response Time, Throughput, Resource Utilization and Hits per Second.

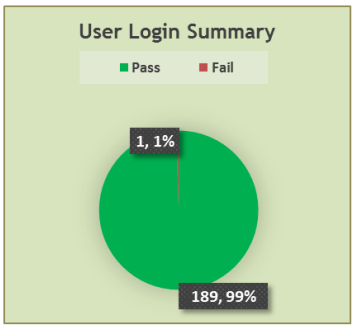
5. Performance Result Summary

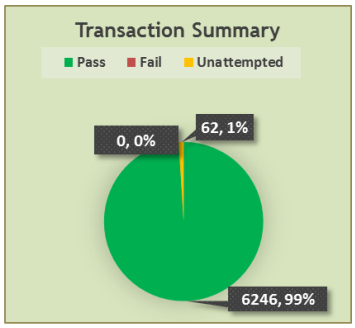
5.1. 100% Combined Load Test

5.1.1. Key Performance Indicators:

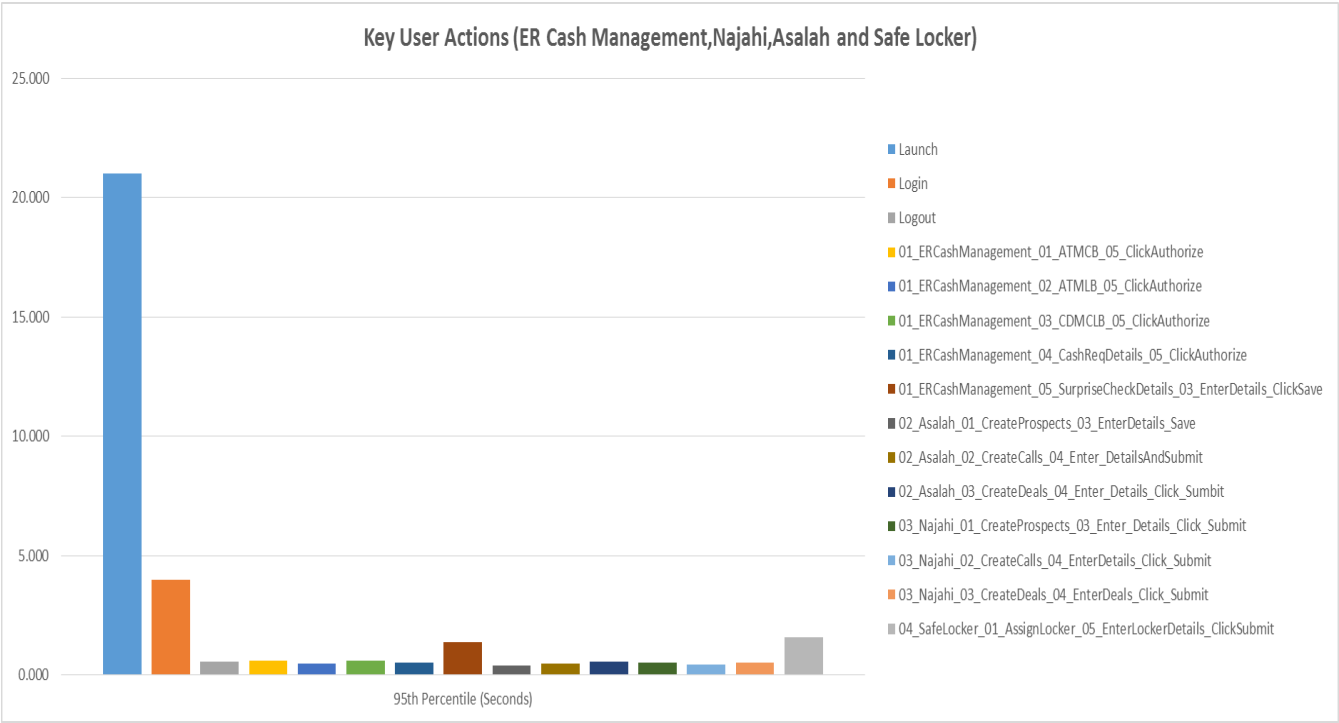








5.1.2. Response Time Analysis for Key User Actions:

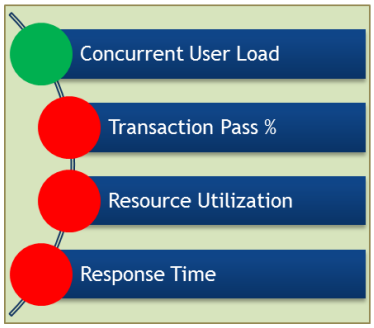


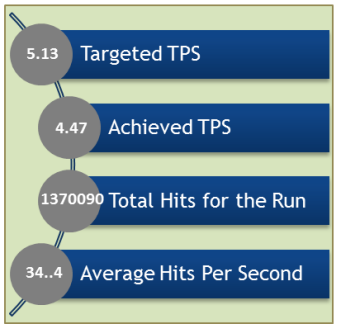
5.1.3. Resource Utilization:

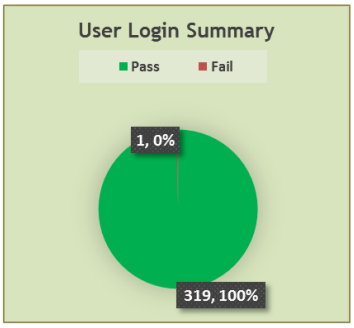
Category	CPU		Memory	
	Avg. CPU%	Max CPU%	Avg. Memory%	Max Memory %
Web Server	55	75	28	28
App Server	1	2	18	18
Database	32	45	25	39

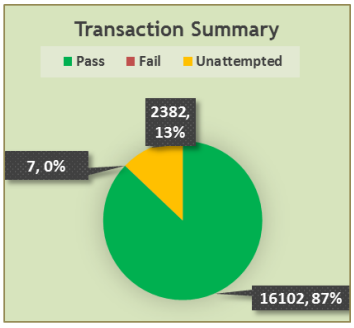
5.2. Breakpoint Test

5.2.1. Key Performance Indicators:

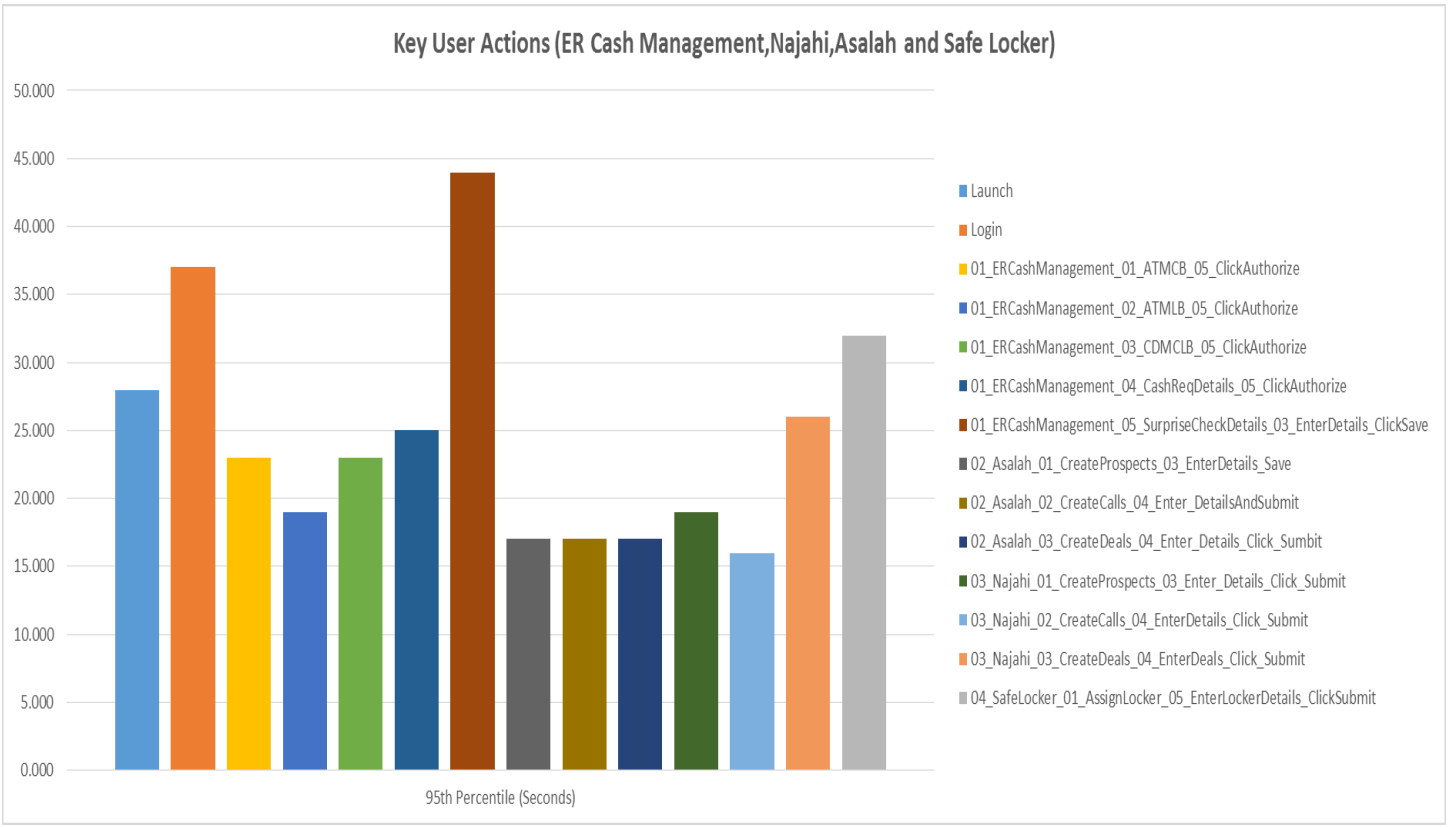








5.2.2. Response Time Analysis:

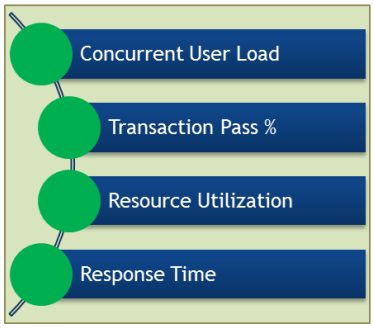


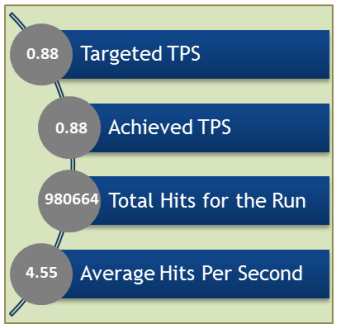
5.2.3. Resource Utilization:

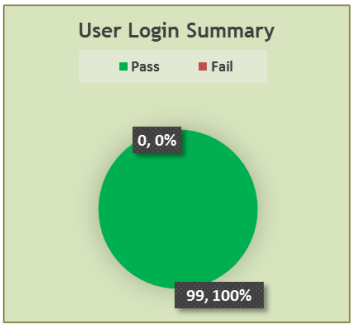
Category	CPU		Memory	
	Avg. CPU%	Max CPU%	Avg. Memory%	Max Memory %
Web Server	78	129	36	39
App Server	1	2	21	21
Database	61	100	17	31

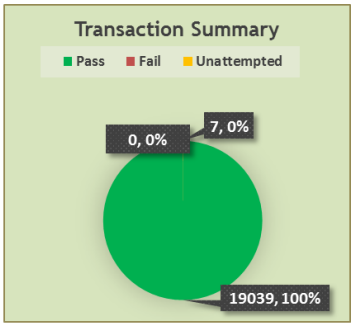
5.3. Endurance Test

5.3.1. Key Performance Indicators:

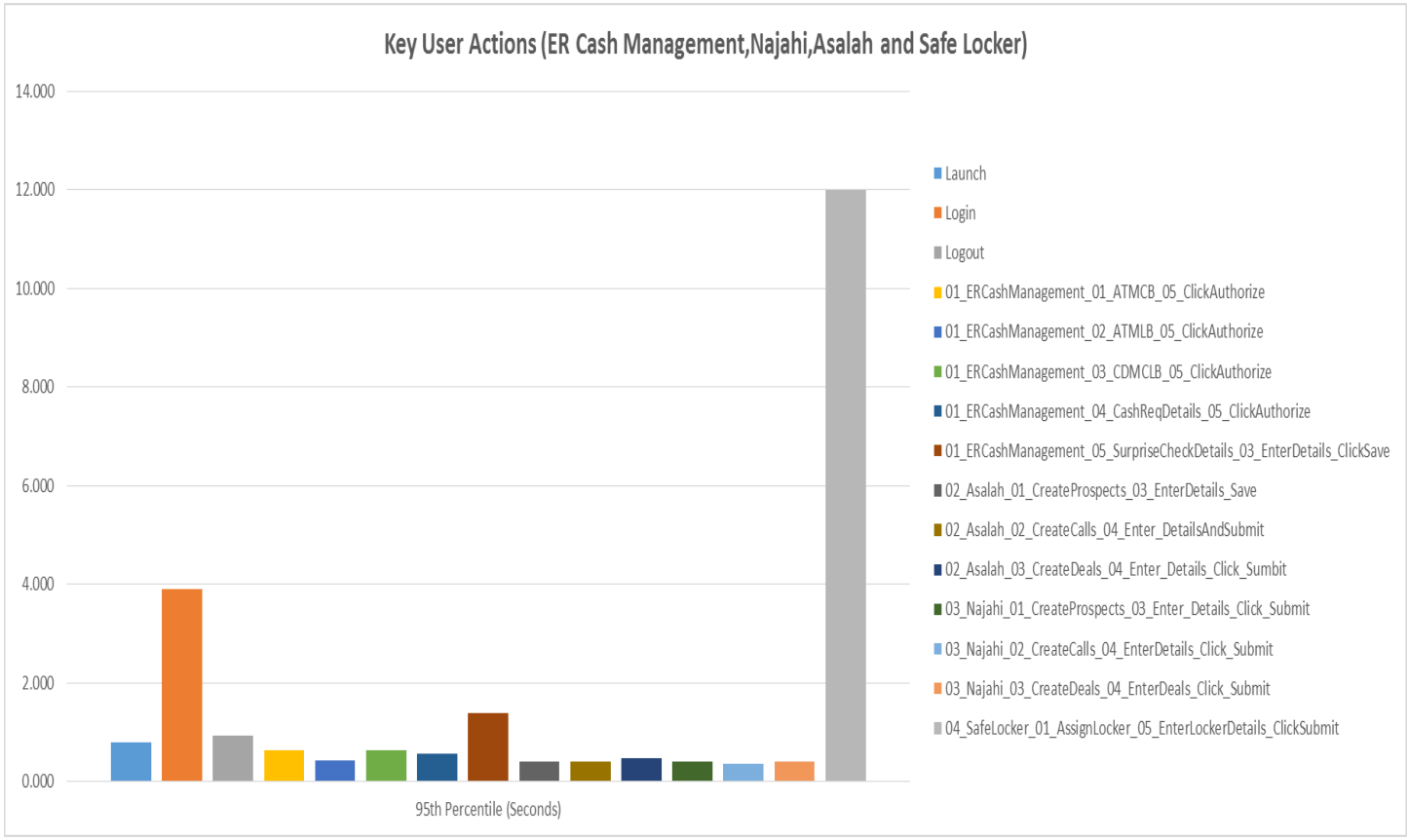








5.3.2. Response Time Analysis:



5.3.3. Resource Utilization:

Category	CPU		Memory	
	Avg. CPU%	Max CPU%	Avg. Memory%	Max Memory %
Web Server	32	66	32	32
App Server	1	3	21	21
Database	23	45	27	41

6. Performance Tuning

S.No	Performance Tuning
1	Large images files size were compressed in Webserver layer
2	Increased CPU from 2 cores to 4 cores in UAT environment
3	Cache settings were enabled in the application
4	Duplicate resource files were removed
5	Queries indexing and optimization to reduce the DB response times
6	ESB Token validation service was triggered each time when a service was triggered, which was changed to once in 24 hours

Note: All the performance Tunings are to be deployed and confirmed before go live to maintain the best performance in production

7. Defect Summery

Defect ID	Title	State
Bug 869385	High Response Time | 30% Load Test Execution | ER Cash Management **TFS Link:** *https://testmstfsappdb/tfs/Bank%20Muscat%20Projects/452%20-%20Replacement%20of%20ER/_workitems?_a=edit&id=869385*	Closed
Bug 873382	High Response Times | 100% Load Test | ER Cash Management **TFS Link:** *https://testmstfsappdb/tfs/Bank Muscat Projects/452 - Replacement of ER/_workitems/edit/873382*	Closed
Bug 878215	High Response Times | Safe Locker Touch Points | Combined Load Test **TFS Link:** *https://testmstfsappdb/tfs/Bank%20Muscat%20Projects/452%20-%20Replacement%20of%20ER/_workItems?_a=edit&id=878215&triage=true*	Closed

8. Annexures

Document Name	Attachment
30% Load Test Execution Summary Report for Cash Management Application	BM_ER_CashManagement_R1C1_30% Load BM_ER_CashManagement_R1C1_30% Lo
100% Load Test Execution Summary Report for Cash Management Application	BM_ER_CashManagement_R2C1_100% Load BM_ER_CashManagement_R2C2_100% L
100% Load Test Execution Summary Report for Asalah and Najahi	BM_ER_NajahiAndAsalah_R1C1_100% Lc
100% Combined Load Test Execution Summary Report	BM_ER_CashManagement_R2C1_100% Load BM_ER_CashManagement_R2C2_100% L
Endurance Test Execution Summary Report	BM_ER_CashManagement_R3C1_Endura
Breakpoint Test Execution Summary Report	BM_ER_CashManagement_R4C1_Breakp

Note: The attached execution summary report is zipped and shared over mail