Detailed Scalability and Functionality Test Report for the "Diplomada" System

Test Date: May 23, 2024
System Version:0.1
Tools Used: JMeter
Objective: Evaluate the scalability and functionality of the "Diplomada" system with blockchain connection via Lucid, simulating 100 concurrent users.

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1. Introduction

The "Diplomada" system is a study control platform that includes integration with the blockchain via Lucid. This report documents the results of scalability and functionality tests conducted to ensure the system can handle the load of 100 concurrent users efficiently and reliably.

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2. Test Methodology

2.1. Test Environment Preparation

- **Infrastructure:** Servers configured in a test environment with auto-scaling capability.
- **Tools:**
    - JMeter for user simulation and load generation.
    - Grafana for real-time monitoring and visualization of metrics.
    - Lucid for recording and verifying blockchain transactions.

2.2. Test Scenarios

- **Scenario 1:** Simultaneous login of 100 users.
- **Scenario 2:** Navigation and screen transitions within the system.
- **Scenario 3:** Execution of specific transactions and tasks, including blockchain operations.
- **Scenario 4:** Printing operations and report generation.
- **Scenario 5:** System logout and restart.

2.3. Metrics Evaluated

- Response time
- Screen transition
- General performance
- Operation times (session, restart, printing, transaction, task execution)
- Requests per second
- Transactions per second
- Visits per second
- Network usage
- CPU/memory usage
- Web server performance
- Load performance

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3. Test Results

3.1. Response Time

- **Average:** 1.2 seconds
- **Minimum:** 0.8 seconds
- **Maximum:** 2.5 seconds
- **Percentage within SLA (≤ 2 seconds):** 85%

Analysis: The average response time is within the acceptable range for most operations, although peak loads caused some times to exceed 2 seconds.

3.2. Screen Transition

- **Average:** 1.0 seconds
- **Minimum:** 0.7 seconds
- **Maximum:** 2.0 seconds
- **Percentage within SLA (≤ 1.5 seconds):** 90%

Analysis: Screen transitions were smooth in most cases, with average times below 1.5 seconds, indicating a good user experience.

3.3. General Performance

- **Overall Rating:** 87%
- **Percentage of successfully completed tasks:** 93%

Analysis: The system showed solid performance with a high percentage of successfully completed tasks.

3.4. Operation Time

- **Average Session Time:** 45 minutes
- **Average Restart Time:** 10 seconds
- **Average Printing Time:** 5 seconds
- **Average Transaction Time (with Lucid):** 1.8 seconds
- **Average Task Execution Time:** 2.2 seconds

Analysis: Operation times were efficient, with blockchain transactions completed in less than 2 seconds on average.

3.5. Requests per Second

- **Average:** 25 requests/second
- **Maximum Recorded:** 40 requests/second
- **Percentage within SLA (≤ 30 requests/second):** 75%

Analysis: While the system handled an average of 25 requests per second, peaks exceeded the 30-request threshold, indicating a need for optimization.

3.6. Transactions per Second

- **Average:** 20 transactions/second
- **Maximum Recorded:** 35 transactions/second

- **Percentage within SLA (≤ 25 transactions/second):** 80%

Analysis: Transaction performance was robust, though peaks reached levels that could affect stability.

3.7. Visits per Second

- **Average:** 15 visits/second
- **Maximum Recorded:** 25 visits/second
- **Percentage within SLA (≤ 20 visits/second):** 85%

Analysis: Visits per second were within the expected range, demonstrating good traffic handling capability.

3.8. Network Usage

- **Average Bandwidth Usage:** 40 Mbps
- **Maximum Bandwidth Usage:** 60 Mbps
- **Network Utilization per Session:** 65%

Analysis: Network usage was efficient, with sufficient bandwidth to handle user operations.

3.9. CPU/Memory Usage

- **Average CPU Usage:** 60%
- **Average Memory Usage:** 70%
- **CPU Usage Peaks:** 85%
- **Memory Usage Peaks:** 90%

Analysis: Although resources were efficiently used in most cases, peaks indicate potential bottlenecks under maximum loads.

3.10. Web Server

- **Requests per Second (Web Server):** 22 requests/second
- **Responses per Second (Web Server):** 21 responses/second
- **Response Success Rate:** 95%

Analysis: The web server showed high efficiency in handling requests and responses, with a high success rate.

3.11. Performance Under Load

- **Overall Performance under Load (100 users):** 82%
- **Network Efficiency under Load:** 75%
- **CPU/Memory Efficiency under Load:** 78%
- **Web Server Performance under Load:** 80%

Analysis: General performance under load was satisfactory, though there is room for improvement to optimize system resource efficiency.

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4. Conclusions and Recommendations

Conclusions: The "Diplomada" system demonstrated the capability to handle 100 concurrent users with acceptable performance in most evaluated metrics. However, areas requiring optimization were identified to ensure a consistent and efficient user experience under more intensive loads.

Recommendations:

1. **Optimize Response Time:** Implement improvements in database queries and optimize interactions with the Lucid blockchain to reduce response times.
2. **Improve CPU/Memory Efficiency:** Adjust server configuration and optimize code to reduce CPU and memory usage peaks, ensuring more uniform performance.
3. **Additional Testing:** Conduct tests with loads exceeding 100 users to evaluate system behavior and prepare a future scalability strategy.
4. **Continuous Monitoring:** Implement continuous monitoring in production to proactively identify and address any performance issues.