Load & Stress Test Report

## 1. Introduction

This report provides an overview of the Load and Stress testing performed to evaluate system performance, stability, and scalability under different levels of workload.

## 2. Test Environment

Hardware Specifications:  
- CPU: Intel Xeon 3.4GHz, 8 cores  
- RAM: 32GB DDR4  
- Disk: SSD 1TB  
- Network: 1Gbps

Software Details:  
- OS: Windows Server 2022  
- Application Version: 3.1.0  
- Database: MySQL 8.0  
- Web Server: Apache Tomcat 9

Test Tools Used:  
- JMeter 5.6  
- LoadRunner  
- Grafana for monitoring

Network Configuration:  
- Client and server connected via secured VPN

## 3. Test Scenarios

Load Test Scenario:  
- Simulated 500 concurrent users over 30 minutes.  
- Expected response time: < 2 seconds.  
- Expected throughput: 200 transactions/sec.

Stress Test Scenario:  
- Simulated 1000 concurrent users.  
- Expected system behavior: Degradation but no crashes.  
- Monitored CPU, memory, and error rates.

## 4. Test Execution Details

Execution Date: 2025-02-03  
Duration: 3 hours

Summary of Test Case Execution:  
- Total Test Cases: 20  
- Passed: 18  
- Failed: 2

## 5. Performance Metrics & Results

| Metric | Load Test Result | Stress Test Result | Threshold |
| --- | --- | --- | --- |
| Avg Response Time | 1.8 sec | 4.2 sec | < 2 sec |
| Peak Response Time | 2.4 sec | 5.8 sec | < 3 sec |
| Throughput | 220 req/sec | 140 req/sec | 200 req/sec |
| CPU Usage | 65% | 95% | < 80% |
| Memory Usage | 12GB | 28GB | < 24GB |

## 6. Observations and Analysis

Key Findings:  
- The system handled 500 concurrent users efficiently but started to degrade at 800 users.  
- CPU usage exceeded 95% under extreme stress, leading to delayed responses.  
- Memory usage remained stable but peaked under high concurrent sessions.  
- Some transactions timed out under heavy load.

## 7. Recommendations & Improvements

- Optimize database queries to reduce load time.  
- Implement caching for frequently accessed resources.  
- Scale infrastructure by adding more application servers.  
- Tune garbage collection settings in the JVM.

## 8. Conclusion

The Load Test was successful within expected thresholds. However, the Stress Test showed degradation in response times beyond 800 users. Performance optimizations are recommended before scaling the system further.