**Batch: T2**

**Assignment No: 5**

**Title of Assignment: Performance Testing**

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**Benchmark Report for Student Management System**

System Under Test: Student Management System

Tested Components: REST API

Tools Used: Apache JMeter

Number of Requests: 2400

Concurrent Users: 50 per API

**Test Scenarios & API Performance**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **API Endpoint** | **# Samples** | **Avg Response Time (ms)** | **Min (ms)** | **Max (ms)** | **90% Line (ms)** | **99% Line (ms)** | **Error %** | **Throughput (req/sec)** |
| GET Student Grades | 600 | 5 | 1 | 192 | 9 | 22 | 0.00% | 2.25 |
| GET Department Courses | 600 | 6 | 1 | 223 | 12 | 31 | 0.00% | 2.25 |
| GET Teacher Schedule | 600 | 6 | 1 | 273 | 10 | 30 | 0.00% | 2.25 |
| GET Department Details | 600 | 4 | 1 | 100 | 6 | 18 | 0.00% | 2.25 |
| Total | 2400 | 5 | 1 | 273 | 9 | 29 | 0.00% | 8.99 |

**Observations:**

* The **average response time is low (5ms)** across all API calls.
* **Maximum response time is 273ms** (GET Teacher Schedule API).
* **No errors (0.00%)**, indicating stable API performance.
* **Throughput is ~9 requests/sec**, meaning the system is handling load efficiently.

**Data Transfer Analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| **API Endpoint** | **Received KB/sec** | **Sent KB/sec** | **Avg. Response Size (Bytes)** |
| GET Student Grades | 1.17 | 0.36 | 532 |
| GET Department Courses | 2.98 | 0.35 | 1359 |
| GET Teacher Schedule | 2.51 | 0.36 | 1143 |
| GET Department Details | 1.02 | 0.35 | 466 |
| Total | 7.69 | 1.41 | 875 |

**Observations:**

* **Department Courses API transfers the most data (1359 bytes per response).**
* **Total bandwidth usage: 7.69 KB/sec received; 1.41 KB/sec sent.**

**Performance Bottlenecks & Issues**

|  |  |  |
| --- | --- | --- |
| **Issues** | **Analysis** | **Suggested Fix** |
| High Max Response Time  (237 ms for Teacher Schedule) | Some API calls take significantly longer | Caching can be used |
| Database query execution time (High Variability) | High standard deviation indicates inconsistent performance | Use of Indexing and Connection Pooling |
| Throughput Limit (~9 req/sec) | Might struggle with higher concurrent users | Enhance Load Balancing |

**Benchmark Report for MCQ Exam System**

System Under Test: MCQ Exam System

Tested Components: REST API

Tools Used: Apache JMeter

Number of Requests: 2000

Concurrent Users: 50 per API

**Test Scenarios & API Performance**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **API Endpoint** | **# Samples** | **Avg Response Time (ms)** | **Min (ms)** | **Max (ms)** | **90% Line (ms)** | **99% Line (ms)** | **Error %** | **Throughput (req/sec)** |
| GET Teacher Exams | 500 | 16 | 1 | 168 | 42 | 104 | 0.00% | 51.57 |
| GET Completed Exams | 500 | 15 | 1 | 168 | 42 | 135 | 0.00% | 51.32 |
| GET Completed Exam Details | 500 | 15 | 2 | 157 | 42 | 73 | 0.00% | 52.25 |
| GET Exam Questions | 500 | 20 | 2 | 178 | 63 | 95 | 0.00% | 52.51 |
| Total | 2000 | 17 | 1 | 178 | 47 | 102 | 0.00% | 205.19 |

**Observations:**

* The **average response time is 17ms**, which is good.
* **Maximum response time is 178ms** (GET Exam Questions API).
* **No errors (0.00%)**, indicating stable API performance.
* **Throughput is ~205 requests/sec**, meaning the system can handle high load efficiently.

**Data Transfer Analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| **API Endpoint** | **Received KB/sec** | **Sent KB/sec** | **Avg. Response Size (Bytes)** |
| GET Teacher Exams | 34.65 | 6.95 | 668 |
| GET Completed Exams | 38.35 | 7.42 | 765 |
| GET Completed Exam Details | 99.04 | 7.50 | 1941 |
| GET Exam Questions | 54.57 | 7.54 | 1064 |
| Total | 223.33 | 29.06 | 1114.5 |

**Observations:**

* **Completed Exam Details API transfers the most data (1941 bytes per response).**
* **Total bandwidth usage: 223.33 KB/sec received; 29.06 KB/sec sent.**

**Performance Bottlenecks & Issues**

|  |  |  |
| --- | --- | --- |
| **Issues** | **Analysis** | **Suggested Fix** |
| High Max Response Time  (178 ms for Exam Questions API) | Some API calls take significantly longer | Caching can be used |
| Database query execution time (High Variability) | High standard deviation indicates inconsistent performance | Use of Indexing and Connection Pooling |
| Throughput Limit (~205 req/sec) | Might struggle with higher concurrent users | Enhance Load Balancing |