1.2.3 Stress Testing

The system described throughout the scheduler’s deliverables is a system which, by the very nature of its usage, will experience varying degrees of client traffic: There will be varying volume of users login in to the system and using it during the day versus the middle of the night or the dates of class registration versus other days between or in the middle of any given semester. This volume of users will tend to be condensed during the same higher traffic times (i.e. during day of course registration) and more spread out during other times. These periods of heavy load on the system can be simulated and exaggerated beyond normal operation the system with a script efficiency tool. The resulting stress test can be applied to a system in order to determine the robustness, response and availability of a correct behavior for any system that may experience variable operation. The generic test is a black box test that can be applied to any system algorithm.

For the purpose of this deliverable, Apache Benchmark (ab) was used as a dynamic software verification and validation method in order to produce repeatable testing with quantitative request times (connect, processing, waiting, and total), transferred bytes (total, HTML, and document) for a given number of requests to be performed and the number of requests that occur simultaneously. A greater number of requests may represent simply a longer period of time (a week vs an hour). However, if a greater number of these requests occur at the same time (concurrency) than what is normal, then we are implementing a stress test in which we can observe several of the stress related defects:

Failure to meet response time requirements.

Failure to run using particular configurations of hardware, operating systems and external libraries.

-libraries

Failure to gracefully handle resource shortage.

-memory fill

Failure to make resources available when they are no longer required.

Failure to fully recover from its own failure state or that of a related system.

-browser

-pluggins

Failure related to the user manual; incorrect or missing information.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Server Hostname | | | | Document Length (bytes) | | | Server Software | | | |
| schedule-heroku.herokuapp.com | | | | 2 036 | | | Apache | | | |
| Concurrency level | | Time for tests  (ms) | | | | Complete Requests | | | Failed Requests | |
| 100 | | 15 807 | | | | 500 | | | 0 | |
| Total transferred  (bytes) | | | | HTML transferred (bytes) | | | Transfer rate  (Kbytes/sec) | | | |
| 1 104 000 | | | | 1 018 000 | | | 68.21 | | | |
| Connection Times  (ms) | | | | | | | | | | |
|  | min | | | | mean | | median | | | max |
| Connect | 22 | | | | 31 | | 30 | | | 815 |
| Processing | 60 | | | | 2663 | | 2937 | | | 3010 |
| waiting | 54 | | | | 1479 | | 1473 | | | 2999 |
| total | 92 | | | | 2694 | | 2967 | | | 3784 |
| Time to a percent of completion (ms) | | | | | | | | | | |
| 50 | | | 75 | | | | | 90 | | |
| 2 967 | | | 3 008 | | | | | 3 034 | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Server Hostname | | | | Document Length (bytes) | | | Server Software | | | |
| schedule-heroku.herokuapp.com | | | | 2 036 | | | Apache | | | |
| Concurrency level | | Time for tests  (ms) | | | | Complete Requests | | | Failed Requests | |
| 500 | | 17 995 | | | | 500 | | | 0 | |
| Total transferred  (bytes) | | | | HTML transferred (bytes) | | | Transfer rate  (Kbytes/sec) | | | |
| 1 104 000 | | | | 1 018 000 | | | 59.91 | | | |
| Connection Times (ms) | | | | | | | | | | |
|  | min | | | | mean | | median | | | max |
| Connect | 24 | | | | 36 | | 30 | | | 3030 |
| Processing | 50 | | | | 10 382 | | 10 412 | | | 17 918 |
| waiting | 50 | | | | 10 374 | | 10 404 | | | 17 915 |
| total | 80 | | | | 10 418 | | 10 444 | | | 17 949 |
| Time to a percent of completion (ms) | | | | | | | | | | |
| 50 | | | 75 | | | | | 90 | | |
| 10 444 | | | 14 218 | | | | | 16 511 | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Server Hostname | | | | Document Length (bytes) | | | Server Software | | | |
| schedule-heroku.herokuapp.com | | | | 2 036 | | | Apache | | | |
| Concurrency level | | Time for tests  (ms) | | | | Complete Requests | | | Failed Requests | |
| 20 000 | | 303 427 | | | | 100 000 | | | 0 | |
| Total transferred  (bytes) | | | | HTML transferred (bytes) | | | Transfer rate  (Kbytes/sec) | | | |
| 220 800 000 | | | | 203 600 000 | | | 68.06 | | | |
| Connection Times  (ms) | | | | | | | | | | |
|  | min | | | | mean | | median | | | max |
| Connect | 20 | | | | 32 | | 30 | | | 3 036 |
| Processing | 4 202 | | | | 570 449 | | 626 140 | | | 663 901 |
| waiting | 1 319 | | | | 317 062 | | 317 014 | | | 651 050 |
| total | 4 234 | | | | 570 481 | | 626 170 | | | 663 931 |
| Time to a percent of completion (ms) | | | | | | | | | | |
| 50 | | | 75 | | | | | 90 | | |
| 626 170 | | | 635 745 | | | | | 657 250 | | |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Server Hostname | | | | Document Length (bytes) | | | Server Software | | | |
| schedule-heroku.herokuapp.com | | | | 2 036 | | | Apache | | | |
| Concurrency level | | Time for tests  (ms) | | | | Complete Requests | | | Failed Requests | |
| 10 000 | | 313 216 | | | | 10 000 | | | 0 | |
| Total transferred  (bytes) | | | | HTML transferred (bytes) | | | Transfer rate  (Kbytes/sec) | | | |
| 2 204 000 | | | | 2 036 000 | | | 68.84 | | | |
| Connection Times  (ms) | | | | | | | | | | |
|  | min | | | | mean | | median | | | max |
| Connect | 20 | | | | 31 | | 30 | | | 3 032 |
| Processing | 1 1142 | | | | 159 379 | | 161 661 | | | 312 704 |
| waiting | 355 | | | | 158 748 | | 161 003 | | | 312 347 |
| total | 1 174 | | | | 159 410 | | 161 689 | | | 312 738 |
| Time to a percent of completion (ms) | | | | | | | | | | |
| 50 | | | 75 | | | | | 90 | | |
| 161 689 | | | 237 593 | | | | | 312 738 | | |

1.2.4 Security Testings

SQL injection

NIKTO

