Performance and load testing results of WebSpellChecker v5.5.3 and v.5.5.4

This document describes the results of performance tests for WebSpellChecker Web API. The performance was tested and accessed depending on the following setup:

- Certain number of users accessing the server simultaneously;
- Cache enabled for spell checking purposes;
- Certain hardware and software used;
- Number of words to be checked;
- Number of spelling and grammar problems in the text.

Testing goal and idea

Our main goal was to observe the average response time of text processing in case when 10/20/50/100/200 users send simultaneous requests to the server between two different versions of WebSpellChecker, namely 5.5.3 and 5.5.4.

Environment and testing tool

We used Apache Jmeter 5.1.1 as a performance measuring tool. The machine used was Amazon AWS m5.large instance with 2 vCPU and 8 GB RAM.

Testing process

We have run our tests 5 times continuously increasing the number of users accessing them. In every test the number of simultaneous users increased by 10, thus, making 5 test cases increasing workload from 10 to 50 users or simultaneous threads. The cache setting was enabled for the first set of tests and disabled later. The tests took place in the following order:

1. 10K words (6K characters) with 10 grammar problems, 50 misspellings;
2. 10K words (6K characters) with 15 grammar problems, 250 misspellings;
3. 10K words (6K characters) with 30 grammar problems, 400 misspellings;
4. 10K words with 50 misspellings only;
5. 10K words with 50 grammar problems only.

We used the concept of *tokens* which is a complete sentence to be spell and grammar checked. In the test setup, we had 10 tokens.

The measured was the response time for versions 5.5.3 and 5.5.4 respectively.

Observations and findings

Our observations are presented in tables and charts below for WebSpellChecker Server versions 5.5.3 and 5.5.4.

- The average time for processing of 1K words containing words in mixed case and misspelled words only grows 15-25% in version 5.5.4 depending on the number of users compared with version 5.5.3,
- If users need to proofread 1K words containing only grammar problems, and there are no misspelled words in these sentences, it will take more time, namely 27,777 seconds in version 5.5.4x compared with 46,551 seconds in version 5.5.5x. For details, see section 1K words with 50 grammar problems only depending on the number of users below.

⚠ Disabled cache setting, which can be specified as the value of the CacheSize parameter in AppServerX.xml file, is a standard scenario of WebSpellChecker setup.

1st test case for 10 simultaneous users

	WSC 5.5.3, response in seconds	WSC 5.5.4 - 10 tokens, response in seconds
Cache disabled for spelling errors		
1K words (6K chars) with 10 grammar problems 50 misspellings	3,680	2,706
1K words (6K chars) with 15 grammar problems 250 misspellings	10,378	10,412
1K words (6K chars) with 30 grammar problems 400 misspellings	14,478	13,869
1K words with 50 misspellings only	3,976	3,666
1K words with 50 grammar problems only	1,668	2,367

Cache enabled for spelling errors		
1K words (6K chars) with 10 grammar problems 50 misspellings	3,124	1,918
1K words (6K chars) with 15 grammar problems 250 misspellings	3,115	2,034
1K words (6K chars) with 30 grammar problems 400 misspellings	3,802	1,855
1K words with 50 misspellings only	3,687	2,303

Chart below represents test results comparison for WSC v.5.3 and WSC v.5.4 and 10 simultaneous users with disabled cache.
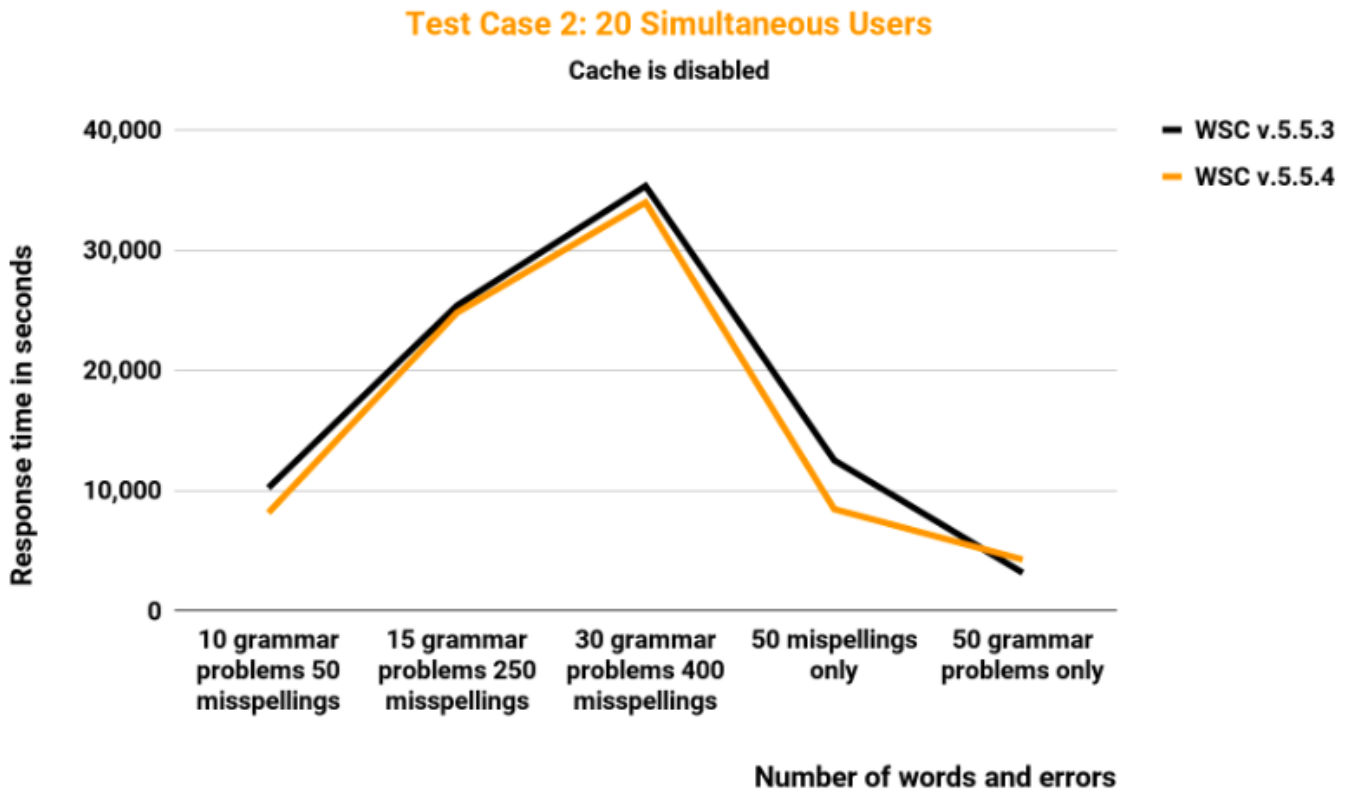

Test Case 1: 10 Simultaneous Users
Cache is disabled
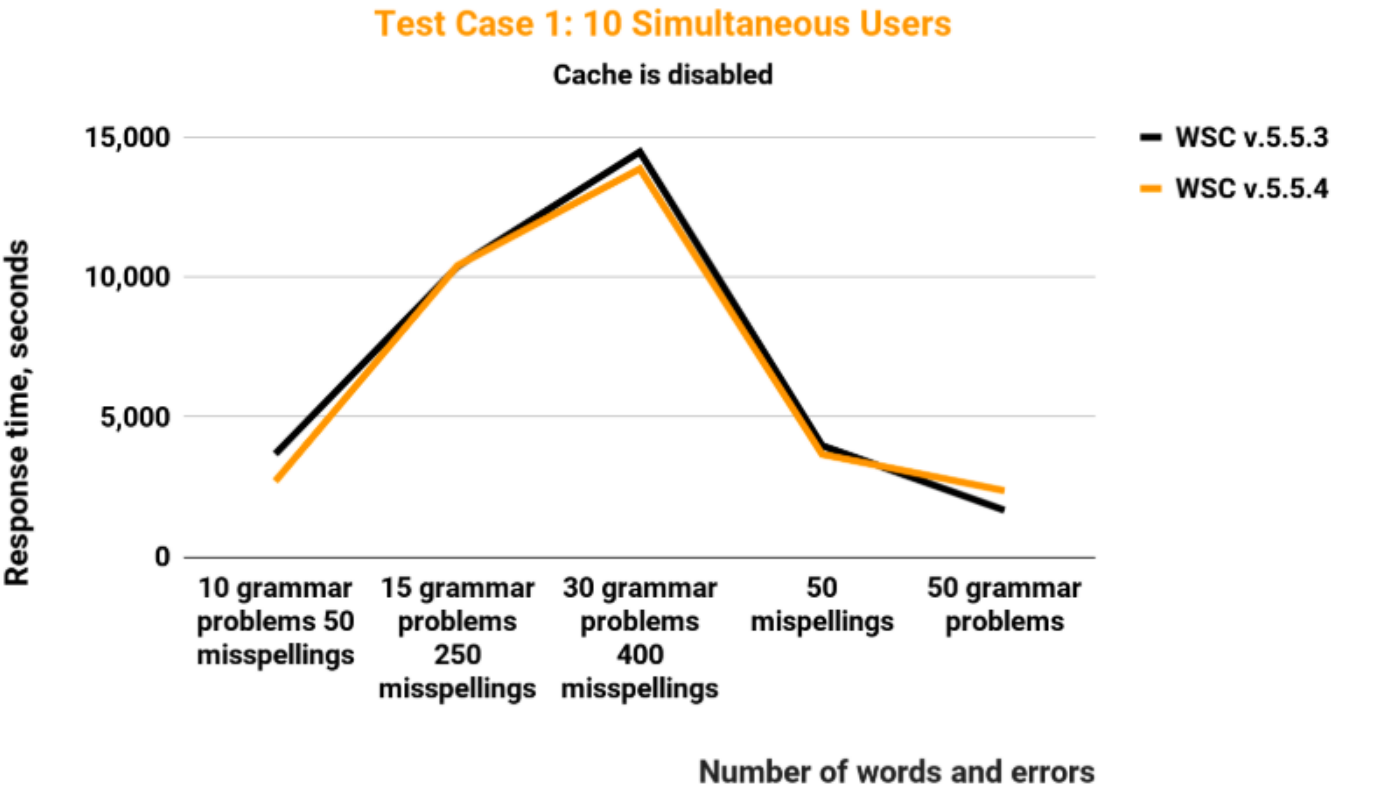
2nd test case for 20 simultaneous users

	WSC 5.5.3, response in seconds	WSC 5.5.4, 10 tokens, response in seconds
Cache disabled for spelling errors		
1K words (6K chars) with 10 grammar problems 50 misspellings	10,229	8,155
1K words (6K chars) with 15 grammar problems 250 misspellings	25,387	24,795
1K words (6K chars) with 30 grammar problems 400 misspellings	35,331	33,962
1K words with 50 misspellings only	12,521	8,456
1K words with 50 grammar problems only	3,160	4,261
Cache enabled for spelling errors		
1K words (6K chars) with 10 grammar problems 50 misspellings	5,275	3,599
1K words (6K chars) with 15 grammar problems 250 misspellings	5,252	3,613

1K words (6K chars) with 30 grammar problems 400 misspellings	5,403	3,125
1K words with 50 misspellings only	7,959	3,855

Chart below represents test result comparison for WSC v.5.3 and WSC v.5.4 and 20 simultaneous users with disabled cache.
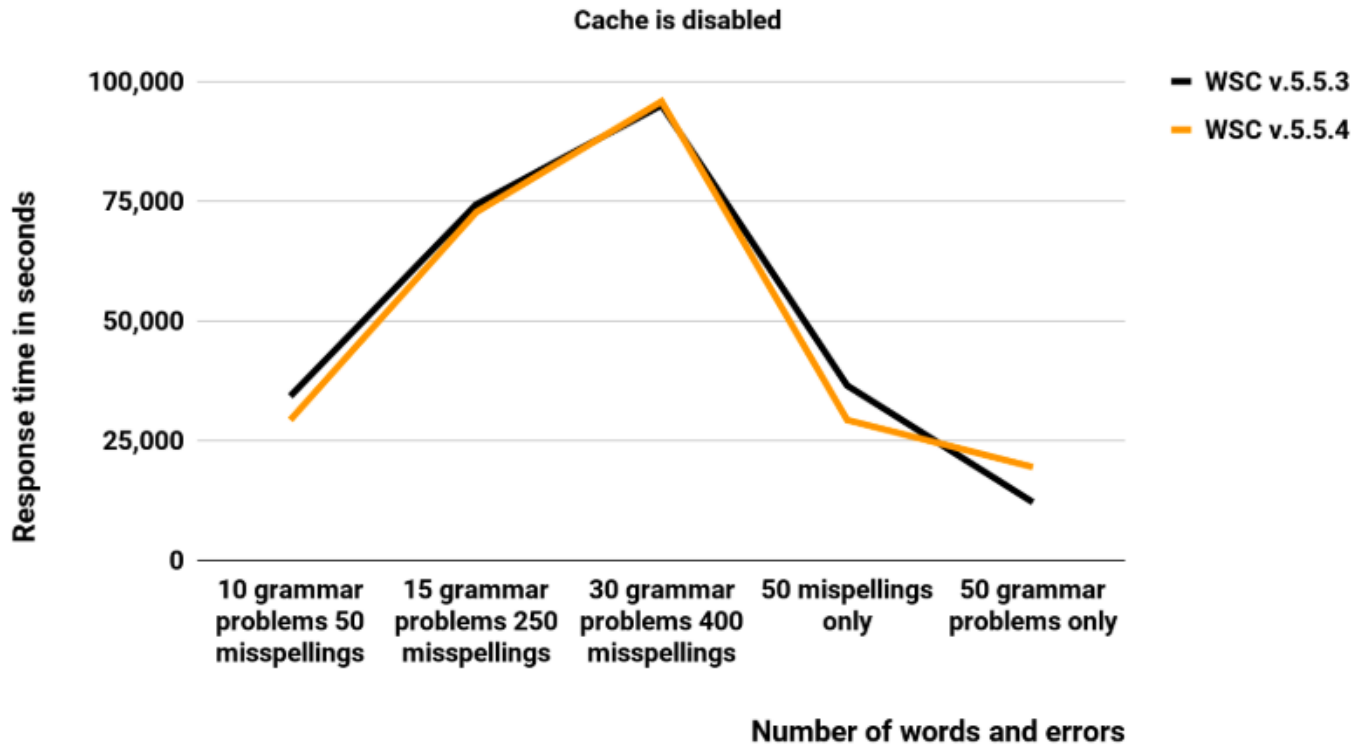

Test Case 2: 20 Simultaneous Users
Cache is disabled

3rd test case for 50 simultaneous users

	WSC 5.5.3, response in seconds	WSC 5.5.4, 10 tokens, response in seconds
Cache disabled for spelling errors		
1K words (6K chars) with 10 grammar problems 50 misspellings	34,262	29,289
1K words (6K chars) with 15 grammar problems 250 misspellings	74,255	72,647
1K words (6K chars) with 30 grammar problems 400 misspellings	95,067	95,850
1K words with 50 misspellings only	36,474	29,277
1K words with 50 grammar problems only	12,094	19,454
Cache enabled for spelling errors		
1K words (6K chars) with 10 grammar problems 50 misspellings	21,304	17,645
1K words (6K chars) with 15 grammar problems 250 misspellings	22,008	17,885
1K words (6K chars) with 30 grammar problems 400 misspellings	23,647	17,539
1K words with 50 misspellings only	24,189	17,910

Chart below represents test result comparison for WSC v.5.3 and WSC v.5.4 and 50 simultaneous users with disabled cache.
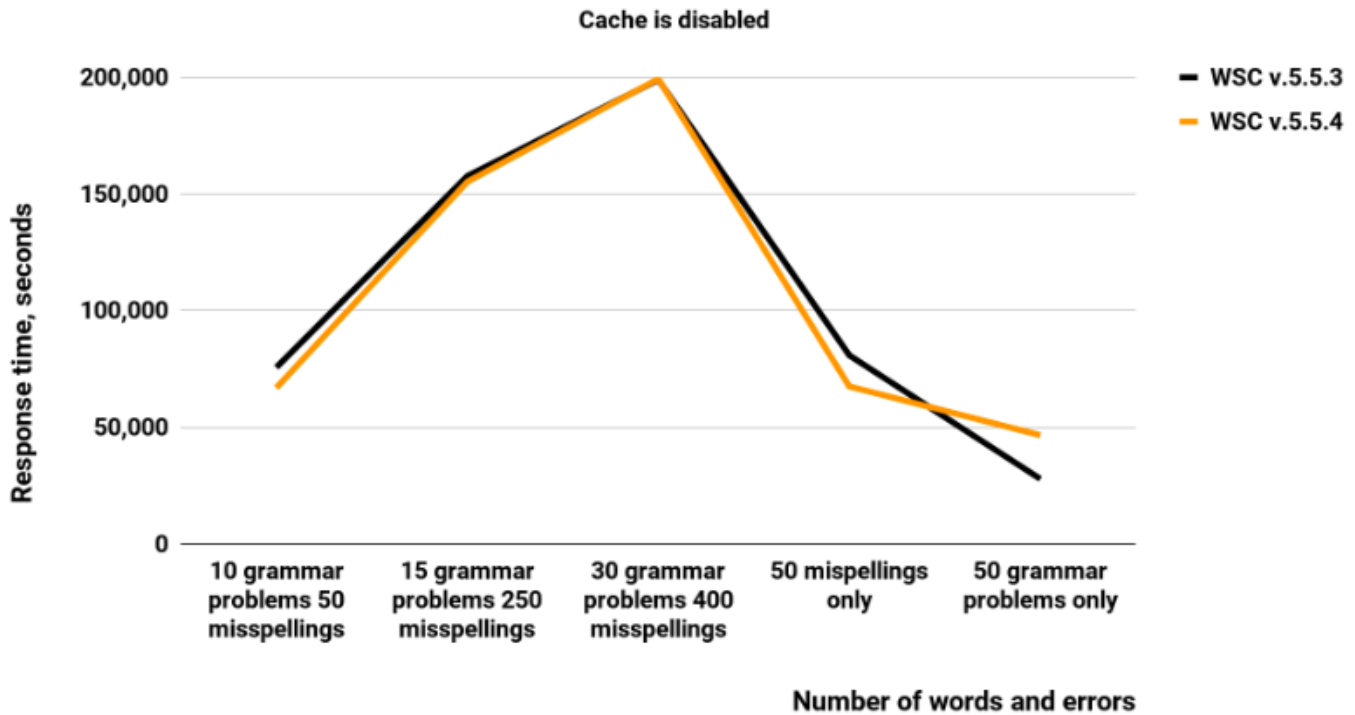
Test Case 3: 50 Simultaneous Users

Cache is disabled

4th test case for 100 simultaneous users

	WSC 5.5.3, response in seconds	WSC 5.5.4, 10 tokens, response in seconds
Cache disabled for spelling errors		
1K words (6K chars) with 10 grammar problems 50 misspellings	75,619	66,855
1K words (6K chars) with 15 grammar problems 250 misspellings	157,668	155,222
1K words (6K chars) with 30 grammar problems 400 misspellings	198,941	199,314
1K words with 50 misspellings only	80,780	67,456
1K words with 50 grammar problems only	27,777	46,551
Cache enabled for spelling errors		
1K words (6K chars) with 10 grammar problems 50 misspellings	50,682	43,647
1K words (6K chars) with 15 grammar problems 250 misspellings	52,005	43,139
1K words (6K chars) with 30 grammar problems 400 misspellings	53,959	43,366
1K words with 50 misspellings only	55,802	43,614

Chart below represents test result comparison for WSC v.5.3 and WSC v.5.4 and 100 simultaneous users with disabled cache.

Test Case 4: 100 Simultaneous Users
Cache is disabled

5th test case for 200 simultaneous users

	WSC 5.5.3, response in seconds	WSC 5.5.4, 10 tokens, response in seconds
Cache disabled for spelling errors		
1K words (6K chars) with 10 grammar problems 50 misspellings	160,952	144,106
1K words (6K chars) with 15 grammar problems 250 misspellings	323,478	314,992
1K words (6K chars) with 30 grammar problems 400 misspellings	409,702	407,870
1K words with 50 misspellings only	170,428	144,126
1K words with 50 grammar problems only	61,754	102,238
Cache enabled for spelling errors		
1K words (6K chars) with 10 grammar problems 50 misspellings	110,704	97,814
1K words (6K chars) with 15 grammar problems 250 misspellings	113,615	97,839
1K words (6K chars) with 30 grammar problems 400 misspellings	113,767	102,991
1K words with 50 misspellings only	120,933	95,217

Chart below represents test result comparison for WSC v.5.3 and WSC v.5.4 and 200 simultaneous users with disabled cache.

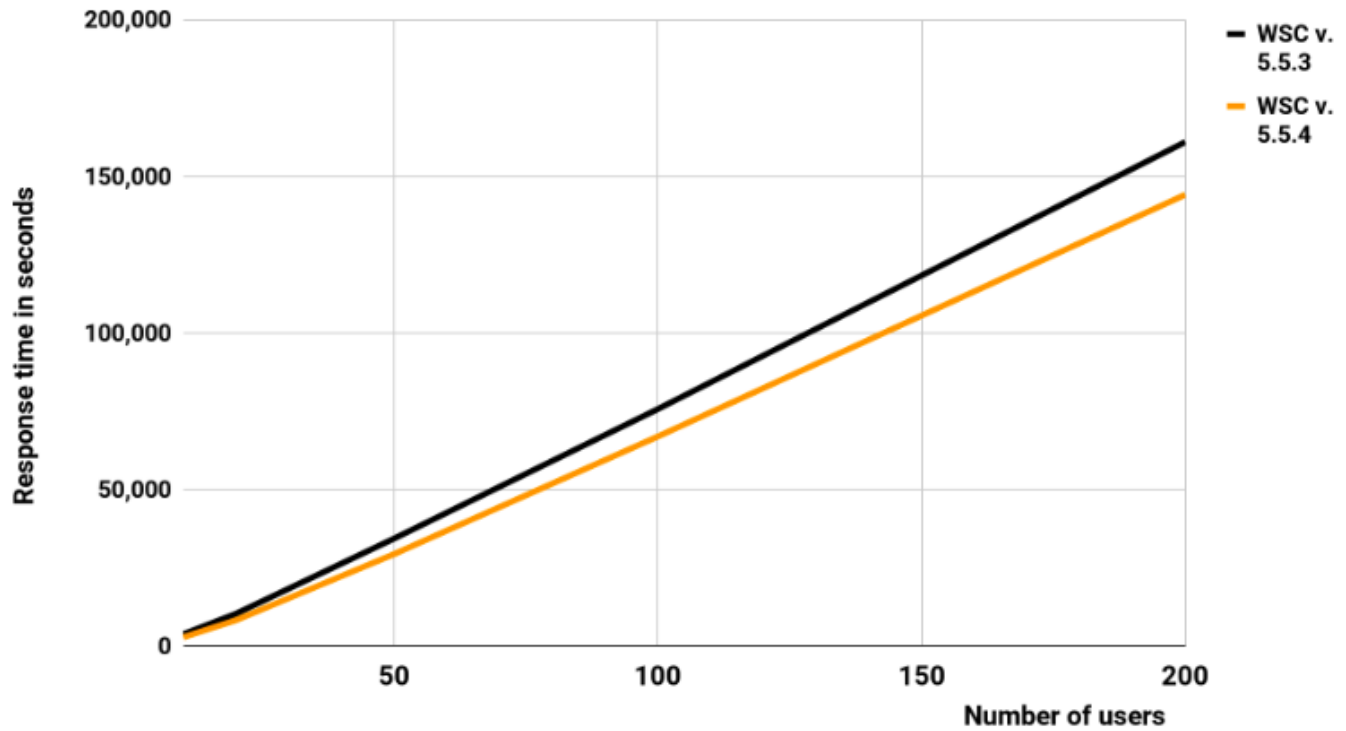**Test Case 5: 200 Simultaneous Users**

Cache is disabled
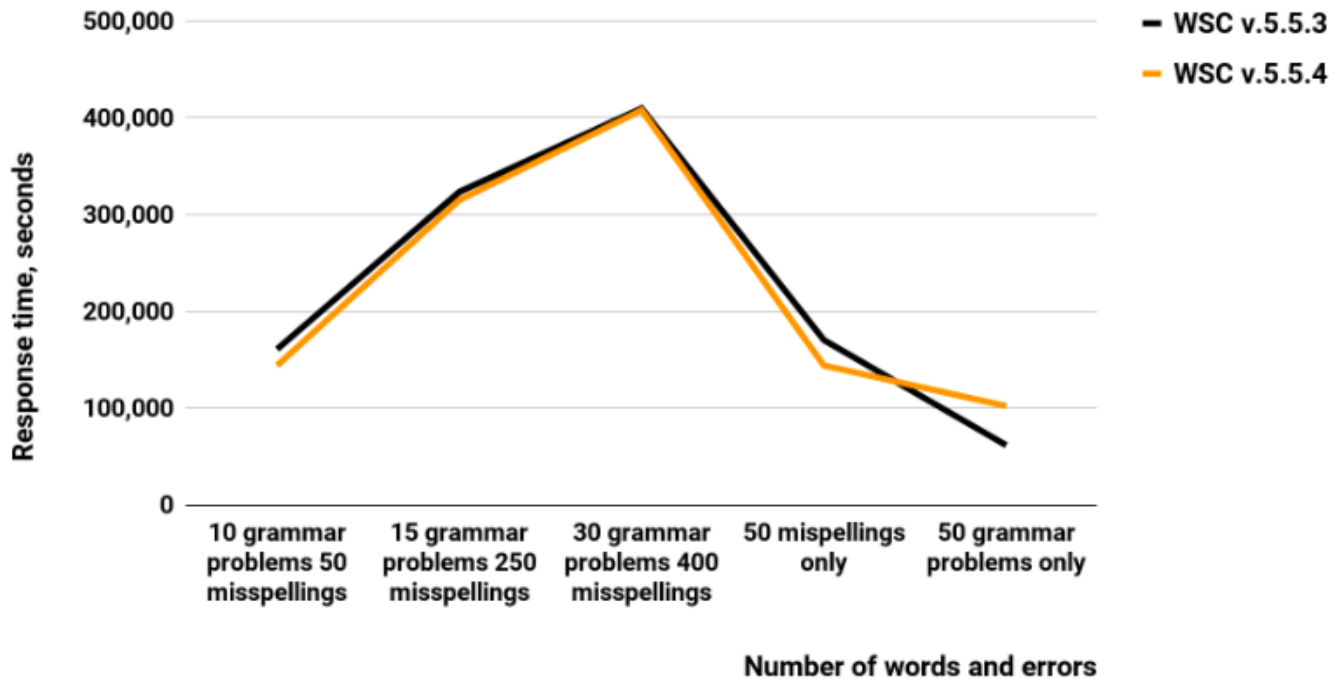
1K words (6K chars) with 10 grammar problems 50 misspellings depending on the number of users

Number of users	WSC 5.5.3, response in seconds	WSC 5.5.4, response in seconds
10	3,680	2,706
20	10,229	8,155
50	34,262	29,289
100	75,619	66,855
200	160,952	144,106

Chart below represents test result comparison for WSC v.5.3 and WSC v.5.4 for different number of users in 10 grammar problems and 50 misspellings scenario.

WSC v.5.5.3 and WSC v.5.5.4 performance depending on the number of users

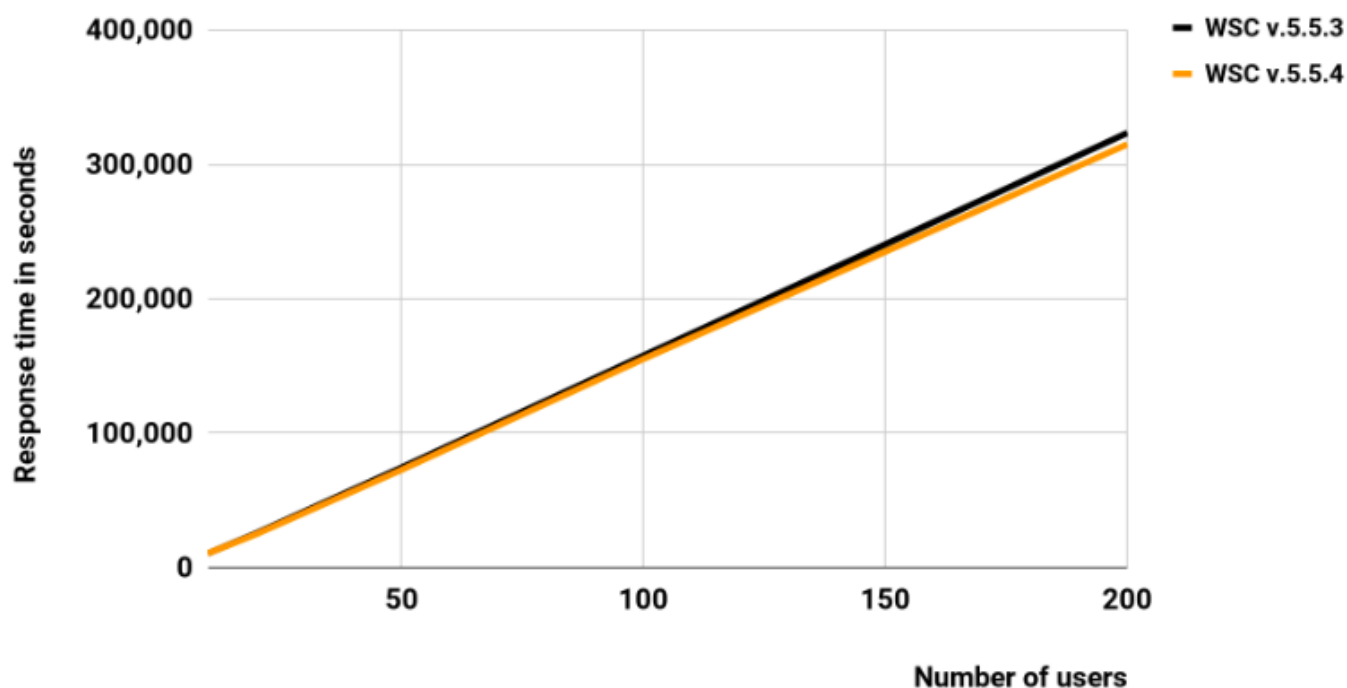### 1K words (6K characters) with 10 grammar problems and 50 misspellings

1K words (6K chars) with 15 grammar problems 250 misspellings depending on the number of users

Number of users	WSC 5.5.3, response in seconds	WSC 5.5.4, response in seconds
10	10,378	10,412
20	25,387	24,795
50	74,255	72,647
100	157,668	155,222
200	323,478	314,992

Chart below represents test result comparison for WSC v.5.3 and WSC v.5.4 for different number of users in 15 grammar problems and 250 misspellings scenario.

WSC v.5.5.3 and WSC v.5.5.4 performance depending on the number of users

1K words (6K characters) with 15 grammar problems and 250 misspellings

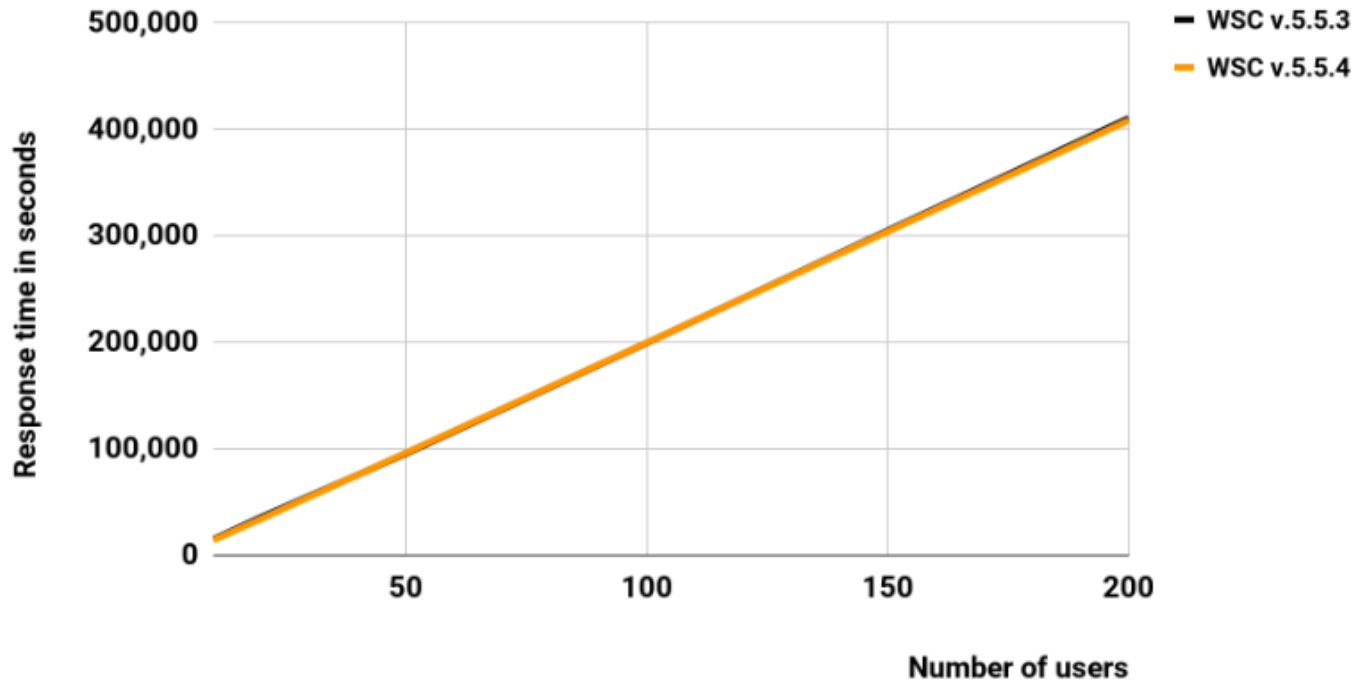## 1K words (6K chars) with 30 grammar problems 400 misspellings depending on the number of users

Number of users	WSC 5.5.3, response in seconds	WSC 5.5.4, response in seconds
10	14,478	13,869
20	35,331	33,962
50	95,067	95,850
100	198,941	199,314
200	409,702	407,870

Chart below represents test result comparison for WSC v.5.3 and WSC v.5.4 for different number of users in 30 grammar problems and 400 misspellings scenario.

WSC v.5.5.3 and WSC v.5.5.4 performance depending on the number of users

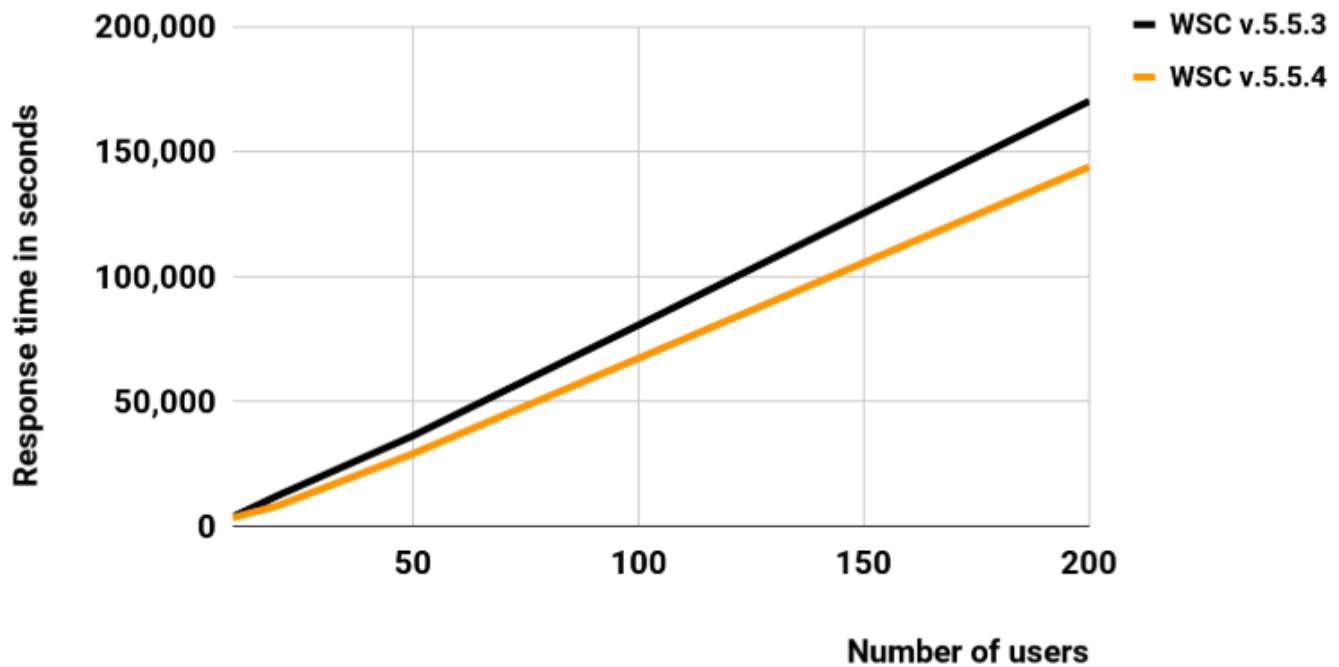### 1K words (6K chars) with 30 grammar problems and 400 misspellings

1K words with 50 misspellings only depending on the number of users

Number of users	WSC 5.5.3, response in seconds	WSC 5.5.4, response in seconds
10	3,976	3,666
20	12,521	8,456
50	36,474	29,277
100	80,780	67,456
200	170,428	144,126

Chart below represents test result comparison for WSC v.5.3 and WSC v.5.4 for different number of users in 50 misspellings scenario.

WSC v.5.5.3 and WSC v.5.5.4 performance depending on the number of users

1K words with 50 misspellings

1K words with 50 grammar problems only depending on the number of users

Number of users	WSC 5.5.3, response in seconds	WSC 5.5.4, response in seconds
10	1,668	2,367
20	3,160	4,261
50	12,094	19,454
100	27,777	46,551
200	61,754	102,238

Chart below represents test result comparison for WSC v.5.3 and WSC v.5.4 for different number of users in 50 grammar problems scenario.

WSC v.5.5.3 and WSC v.5.5.4 performance depending on number of users

1K words with 50 grammar problems
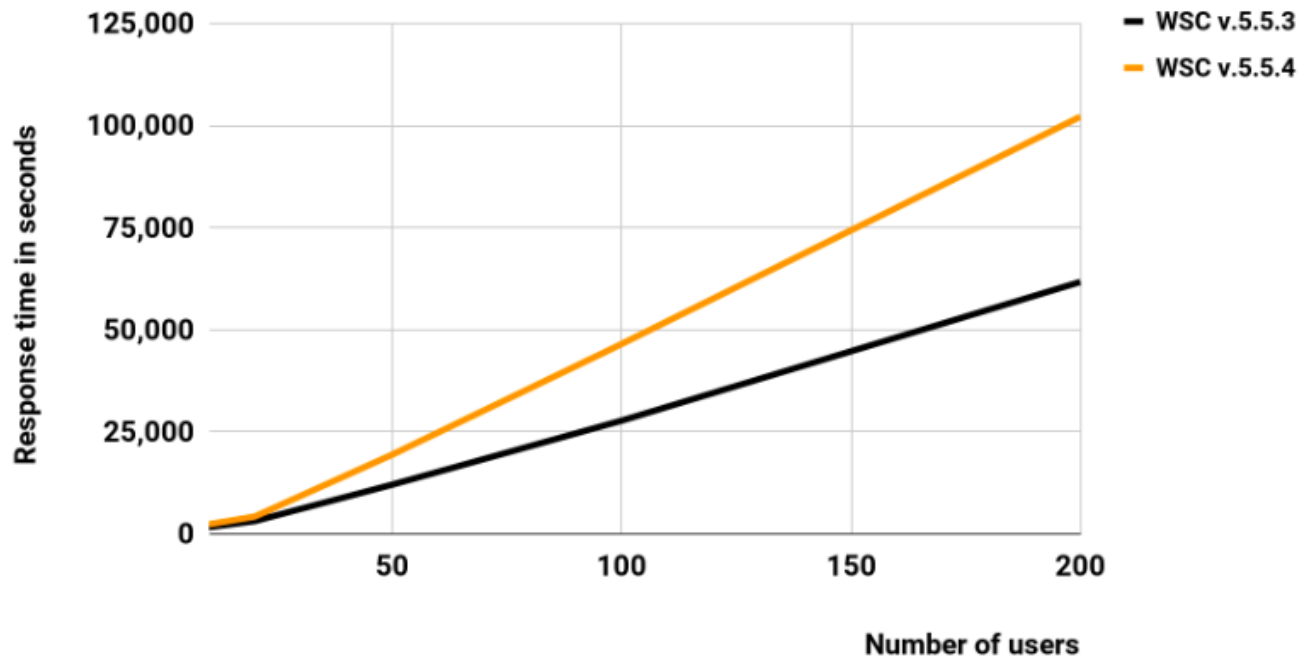
Recommendations

Here are the outcomes and aftermath as well as our advice on hardware and software requirements and notes on performance issues which users may encounter:

- General performance of our spell check engine has increased, but grammar engine performance is not as high as expected. For details, see the charts showing test results depending on the number of users. For example, 1K words (6K chars) with 15 grammar problems 250 misspellings and other graphs in this section.
- 1 m5 instance can process 150-200 simultaneous users, or simultaneous threads, without any issues, but when the number of users increases to 200+, it entails 100% CPU load and a significant increase of response time. Our recommendation for he case when more users are added and CPU load constantly reaches 100% on the machine:
  - upgrade instance type and add more CPUs to it;
  - add one more machine to distribute the traffic (requests) between two or more machines, for example, using Load Balancer.

When cache is enabled, tests run much faster, and the results are almost identical for different cases due to the processed texts are the same. This case needs refinement of the text uniqueness or some text randomising for each request being sent. Our recommendation for this case is the following: specify the desired value of the CacheSize parameter in AppServerX.xml file to increase the speed of requests processing.