Performance Testing Mentoring Program 2022-2023

Task 10

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1 Goal

Perform long-time testing under low load, determine KPI and calculate it, try to identify any issues based on the results.

Prerequisites: previously generated 1000 text posts.

As a Low load, ~30% of the System Capacity was taken, namely 11 users, including 7 with the role of anonymous, and two each with the roles of admin and editor.

Duration long time test: 8 hours

High-level description of the load model: Testing for a combined scenario describing scenarios for simultaneous work with the BlogEngine.NET 3.2. by users with the roles admin, editor, anonymous.

Testing scenario: simulating user behavior on the site, where:

Admin - Open home page, log in as Admin user, open Admin's page, check number of Anonymous users and decide to add or delete user, finally Log out

Editor - Open home page, log in as an Editor user, open a predefined date, open a random post and edit it, rapid it 50 times, and finally Log out.

Anonymous user - visits different pages, opens posts and leave comments.

Test environment: test application and load generator are running on the same computer. Application is executed on the virtual machine and the load generator is executed on the host.

2 Summary

Perform long-time testing application BlogEngine .NET 3.2 (web) with low load test data as different numbers of text posts (100, 1000, 2000, 5000) showed some change in Key Performance Indicators over time.

For convenience of analysis, the total duration of the eight-hour test was divided into 4 sections of 2 hours each.

So Throughput avg for the entire test was 12 rps and gradually decreased throughout the test. In the 0-2h segment it was 14 rps, for the 2-4h segment it was 13 rps, for the 4-6h segment it decreased again and amounted to 12 rps. For the 6-8h segment, it was the smallest and amounted to 10 rps (which is 28% less than in the 0-2h time segment).

The average CPU usage for the entire test was 86% and gradually increased throughout the test. So if for the 0-2h section it was 76%, for the 6-8h section it was 91%.

The average response time overall for all requests for the 6-8h segment increased by about 3.5 times compared to the 0-2h segment.

Average error rate, although for the entire test was 0.6%, but increased significantly from 0.2% in the 0-2h section to 1% for the 6-8h section.

Bottleneck suggestion:

Considering that during the test, edits in posts in some cases increased the size of the text of the most popular posts published on the days included in the list of predefined dates by 2 or more times. If we take into account the increase in response time, combined with the frequency of requests for which such an increase in data volume could affect such requests in the first place (Open Random post, Open first post, TC_Open Predefined Date, TC_Search by Name, leave a comment). It looks like the slightly increased system load resulted in an increase in average CPU usage which was already high and had no potential to compensate for the increased load.

3 What was tested

BlogEngine.NET 3.2 (web) (Executed on the application server)

Parameters of the system under test:

VirtualBox Graphical User Interface Version 7.0.4 r154605 (Qt5.15.2), Windows Server 2016 Standard (64-bit)

OS Name: Microsoft Windows 10 Enterprise, (64-bit) Version 10.0.19044 Build 19044

Base memory: 2,0Gb

Processor: Intel(R) Core(TM) i7-10610U CPU @ 1.80GHz, 2304 Mhz, 1 Core(s), 1 Logical Processor(s)

Storage: Virtual size 60.00 GB

Network: Bridged adapter, Intel® Wi-Fi 6 AX201 160Mhz

4 Load generator system options

Load generator tool: Apache JMeter 5.5 (Executed on Host)

OS Name: Microsoft Windows 10 Enterprise (64-bit) Version 10.0.19045 Build 19045

Base memory: 32,0 GB

Processor: Intel(R) Core(TM) i7-10610U CPU @ 1.80GHz, 2304 Mhz, 4 Core(s), 8 Logical Processor(s)

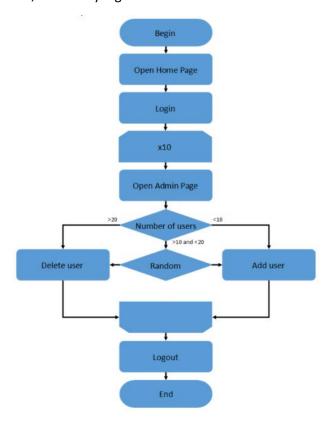
Storage: C: 248 Gb, D: Locked

Running Tests: Jenkins

Collection and visualization of metrics: InfluxDB, Telegraf, Grafana

5. Admin script

First, open the home page then log in as an Admin user, after that 10 times check number of Anonymous users and decide to add or delete users, and finally log out.



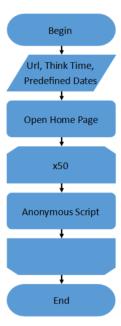
6. Editor script

First, Open home page, log in as an Editor user, open a predefined date, open a random post and edit it, rapid it 50 times, and finally Log out.



7. Anonymous Script

First, open the home page then 50 times runs Anonymous Script.



In the Anonymous Script:

Step 1. The following pages open with the following probabilities:

1. Home Page: 15%

2. Open Random Date: 10%

3. Open Predefined Date: 30%

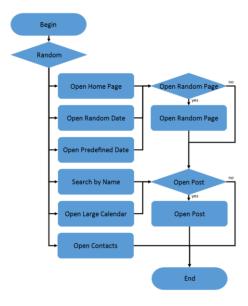
4. Search by Name: 30%

5. Open Large Calendar: 10%

6. Open Contacts: 5%

Step 2. If Step 1 is opened one of the first three pages (home page, page of random date, page of predefined date from csv file) then make a random decision to open or not to open a random page (if there is more than one page with posts).

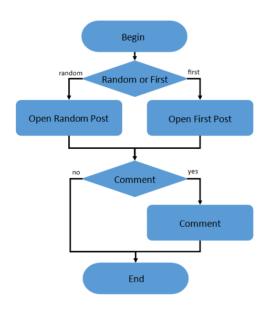
Step 3. After Step 2 (or after Step 1 if there was no opened one of the first three pages) make a decision to open or not to open a post with 80% / 20% probabilities.



If "Open post script" is selected

Step 1. Make a decision to open a random post of the first post with 65% / 35% probabilities.

Step 2. Make a decision to add a comment or not with 20% / 80% probabilities.



8 Aggregated test results

Perform long-time testing application BlogEngine .NET 3.2 (web) with low load test data as different numbers of text posts (100, 1000, 2000, 5000) showed some change in Key Performance Indicators over time.

For convenience of analysis, the total duration of the eight-hour test was divided into 4 sections of 2 hours each.

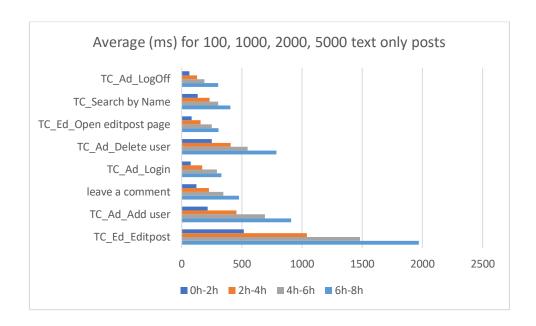
Performance Indicators	0h-2h	2h-4h	4h-6h	6h-8h	All time
Throughput max (rps)	18	17	18	16	18
Throughput avg (rps)	14	13	12	10	12
CPU usage max (%)	100	100	100	100	100
CPU usage avg (%)	76	87	87	91	86
Memory usage max (%)	88	92	91	90	92
Memory usage avg (%)	80	81	81	82	81
IIS stopped during the test	N	N	N	N	N
An effective duration of test (sec)	7202	7202	7202	7201	28807
Transactions count	102798	90215	83109	74370	350492
Error count	225	526	624	732	2110
Averge error rate (%)	0.2	0.6	0.8	1.0	0.6

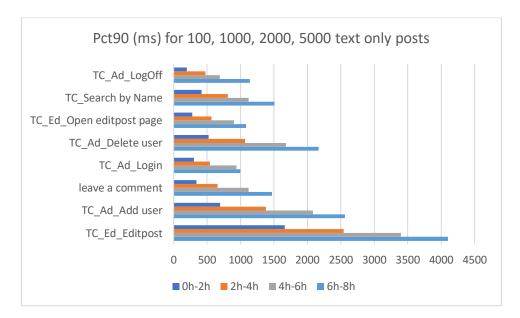
So Throughput avg for the entire test was 12 rps and gradually decreased throughout the test. In the 0-2h segment it was 14 rps, for the 2-4h segment it was 13 rps, for the 4-6h segment it decreased again and amounted to 12 rps. For the 6-8h segment, it was the smallest and amounted to 10 rps (which is 28% less than in the 0-2h time segment).

The average CPU usage for the entire test was 86% and gradually increased throughout the test. So if for the 0-2h section it was 76%, for the 6-8h section it was 91%.

The average response time overall for all requests for the 6-8h segment increased by about 3.5 times compared to the 0-2h segment.

The graph shows the average response time and the 90th percentile for the 8 most time-consuming queries.





Average error rate, although for the entire test was 0.6%, but increased significantly from 0.2% in the 0-2h section to 1% for the 6-8h section.

9 Detailed test results

1 Test results for all test:

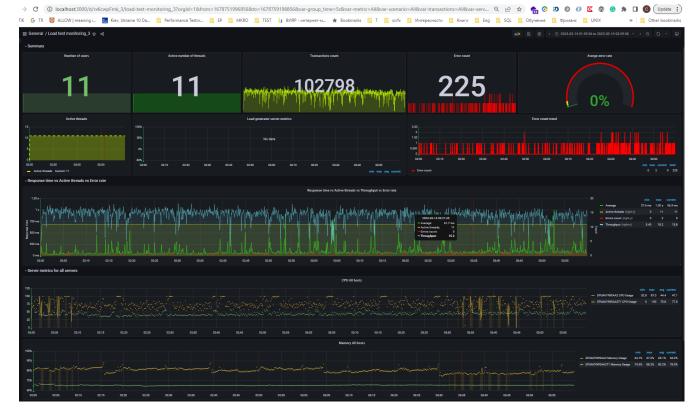




Aggregate report:

transaction							
Open Random post		186.91	966.40				
Open first post		354.64					
TC_Ad_Add user					23.92 K		119.00
TC_Ad_Delete user					94.89 K	95.83 K	
TC_Ad_LogOff							
TC_Ad_Login			940.00				
TC_Ad_Open Admin Page							
TC_Ad_Open Home page			634.80				
TC_Ad_Open USERS menu							
TC_Ad_Open Users page							20.00
TC_Ad_Open login page							
TC_Ed_Editpost							
TC_Ed_LogOff	158.00			870.00			
TC_Ed_Login	160.00	124.82		686.50			
TC_Ed_Open Home page	160.00		583.50	898.05			
TC_Ed_Open Predefined Date		130.48	656.80				
TC_Ed_Open Random post			736.50				
TC_Ed_Open editpost page							
TC_Ed_Open login page	160.00	280.20					
TC_Open Contacts							
TC_Open Home page							
TC_Open Large Calendar		150.65					
TC_Open Predefined Date		155.65	824.20				
TC_Open Random Date							
TC_Open Random page =1							
TC_Open Random page >1							
TC_Search by Name		268.38					
TC_start_Open Home page		150.05					
leave a comment	18.49 K					95.45 K	

2 Test results for 0-2h:

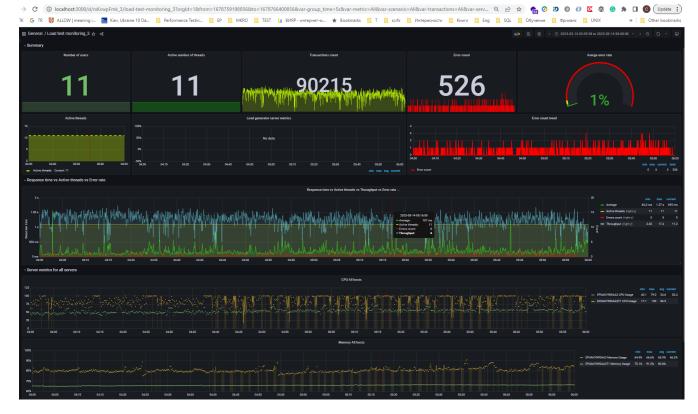




Aggregate report:

Open Benderman of Miral175852501546176127641647641647641647641647641647641647	transaction	NumberOfSamples >	Average	pct90	pet95	pet99	Min	Macc	Error Count
RC_Alleatin Name 12118 1848 1848 1958 288 1848	Open Random post								
Open Too page 12K (2) (11 km) 12K (2) (2)	TC_Open Predefined Date			249.60					
CQ Que Monte page 411K 71.77 21.78 41.89 121.K	TC_Search by Name			418.40					
Mark comment	Open first post								
TC.Open Larger Calentine 46K 78.8 237.0 10.8 33K 46 35K - Commentation TC.Open Larger Calentine 46K 46K 232.0 48.10 31K 60.0 31K 20.0 EX.A.Open Larger Early 34K 184.7 300.0 100.0 42K 20.0 42K 00.0 20K 00.0 20K 42K 00.0 20K 00.0 00.0 20K 00.0 <th>TC_Open Home page</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	TC_Open Home page								
TC. Open Resident One 4.61 M 4.61 M 3.61 M 5.61 M 5.63 M - 1.03 M TC. Alforent Laws per Combinate Space 3.64 M 1.62 M 3.03 M 1.60 M 2.75 M 3.05 M 1.00 M 2.75 M 1.00 M 3.05 M 2.75 M 3.00 M 1.00 M 2.75 M 1.00 M 2.75 M 2.00 M	leave a comment							88.00 K	3.00
TC. ALCogen them page 144K 1540 5030 160K 275K 1160 256K 200 TC. ALCogen to Michan (Page) 344K 377 1808 613K 224K 280 247K 60 TC. ALCogen from the page (Page) 344K 353 1408 6730 224K 280 247K 0 TC. ALCogen from the page (Page) 344K 343K 444P 3132 4486 30K 460 31K 0 224K 0 0 0 0 10 10 0 0 0 24K 0 0 </td <th>TC_Open Large Calendar</th> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	TC_Open Large Calendar								
TC. ALC Joyne DEED Remon 24 M. 24	TC_Open Random Date								
TC.Ad.Spen Admin Page 144 K 558 1740 22/10 278 K 200 279 K - Comment of	TC_Ad_Open Users page								3.00
CO. Que Render pager 1 23K 48F 1320 4866 39K 400 31K - Co. CE. Li, Que Render pager 23R 22R 22R 40 22K 40 22K - Co. CE. Li, Que Render pager 23R 448 1228 419 22K 40 22K - Co. CE. Li, Que Render Day 22R 468 128 379 602 29K 80 24K - Co. CE, Li, Collect Pager 22R 488 379 602 29K 80 24K - Co. CE, Li, Collect Pager 22R 514 418 219K 219K 80 24K 110 - Co. CE, AL, Collect Pager 12R 248 22R 487 40 487 20 - Co. CE, AL, Collect Pager 12R 212R 41K 410 12R 41K 41K 27K 40 47K 20 - Co. - Co. - Co. - Co. - Co.	TC_Ad_Open USERS menu								6.00
T.E.E.Copen residency page 2.28 K 52.8 K 27.40 St. 50.70 St. 5	TC_Ad_Open Admin Page								
TC.Ed.Copen Reduction pout 22 kK 48 kB 182-90 420 ls 22 kK 60 ls 22 kK 10 ls 10 ls 11 ls 10 ls 12 ls 10 ls 22 kK 10 ls 11 ls 10 ls 11 ls 10 ls 11 ls 10 ls 11 ls 20 ls 12 ls <th< td=""><th>TC_Open Random page >1</th><td></td><td></td><td></td><td>648.65</td><td></td><td></td><td></td><td></td></th<>	TC_Open Random page >1				648.65				
TC_EC_Open Principated Date 228 K M.BB 217.00 M65.23 239 K E.BB 244 K	TC_Ed_Open editpost page								
TC_BE_Effortion 22 N 5144 1.0 N 1.3 N 213 N 51.0 N 1.4 A 11.0 N TC_BE_Effortion seer 1.5 N 2.5 0 S 2.3 1 1.5 N 1.5 N 0.5 N 0.5 N 0.5 N 2.0 N TC_BALE_Fortion Seer 1.5 N 2.5 1 0.2 0 1.5 N 4.7 N 0.5 N 0.5 N 2.0 N 0.5 N	TC_Ed_Open Random post								•
TC./AL/Colors user 1818 2819 2210 1884 8508 650 8545 20 TC./AL/Colors 1518 2271 0220 1224 4274 60 4274 200 TC./All-Colors 1518 723 7120 1284 2784 60 2244 0 - TC./All-Colors Home page 1610 78.4 7193 7923 2284 80 224 - - TC./AL/Son Home page 1650 1654 4160 1554 218 118 518 224 0 - <t< td=""><th>TC_Ed_Open Predefined Date</th><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>•</td></t<>	TC_Ed_Open Predefined Date								•
TC.Ade.Add sair 1.81 K 2131 692.00 1.22 K 4.7 K 9.00 4.7 K 250 TC.Oser Comment 1.63 K 7.53 7.22 D 1.64 K 2.70 K 4.00 2.2 K 6.0 6.0 7.0 7.0 7.0 7.0 7.0 2.2 K 8.0 2.2 K 6.0 2.2 K 6.0 7.0	TC_Ed_Editpost								191.00
TC. Open Contains TC. Act Copen Trains (Copen Contains) TC. Act Copen Trains (Copen Contains) TC. Act Copen Trains (Copen	TC_Ad_Delete user					85.80 K		86.65 K	2.00
TC_ALLspein \$16.00 78.48 218.00 76.23 22.24 \$2.00 \$2.25	TC_Ad_Add user								20.00
TC_ALL_Spin Inspirage 3650 109.54 418.00 1.65 K 5.14 K 61.00 5.15 K - TC_ALL_Spin Inspirage 3650 427 162.00 316.00 1.97 K 80.0 188 K - TC_ALL_Spin 365.00 7.25 318.00 122 K 15.00 188 K - TC_ALL_Spin 365.00 44.77 166.00 378.50 122 K 15.00 124 K - TC_ALL_Spin 46.00 45.00 233.00 56.4 220 K 7.00 229 K - TC_ELL_Spin Spin Spin Spin Spin Spin Spin Spin	TC_Open Contacts								*
TC_ALSpen finnerappe 255.00 48.21 155.20 216.00 157K 8.00 158K - TC_ALspen Company 255.00 255	TC_start_Open Home page								*
TC_ALLugar 3650 74.65 3000 2735 187K 1500 188K - TC_ALlugar 1000 1847 1860 2735 187K 1500 188K - TC_ALlugar 1000 1847 1860 2735 172K 1500 124K - TC_ALlugar 1000 1740 1740 1740 1740 1740 1740 1740	TC_Ad_Open login page								
TC_A4Legefff 36500 6447 19600 378.65 122K 10.00 124K - TC_Spen Spentrum page-1 34600 7720 23380 964.5 224K 760 227K - TC_E45 Spentrum page-1 4600 2558 1.35K 202K 202K 202K 202K 202K 202K 202K 20	TC_Ad_Open Home page								
TC_Open Renders page 1 246 00 5720 23340 56545 238K 7.00 229K - TC_ECG_Pen Renders page 2 46.00 2358 155K 202K 222K 272K 57.00 229K - TC_ECG_Pen Renders page 2 46.00 2558 155K 202K 222K 272K 57.00 222K - TC_ECG_Pen Renders page 2 46.00 150K 15.00 150K 15.00 150K 15.00 150K - TC_ECG_Pen Renders page 1 250K 150K 150K 150K 150K 150K 150K 150K 1	TC_Ad_Login			300.90					
TC_EL_Open login page 46.00 2558 1.55K 202K 222K 67.00 222K - TC_EL_Open login page 46.00 5545 15560 160.00 174.00 10.00 174.00 - TC_EL_Open login page 46.00 71.00 2592 802.00 126K 14.00 126K -	TC_Ad_LogOff								
TC_EL_Oper-Home page 44.00 35.95 105.60 160.00 174.00 10.00 174.00 - TC_ELLogin 44.00 71.90 299.20 802.00 126.K 14.00 126.K -	TC_Open Random page =1	346,00							•
	TC_Ed_Open login page								
	TC_Ed_Open Home page								
TC_Be_Leg0ff 444.00 23.12 81.60 145.75 207.00 11.00 207.00 -									
	TC_Ed_LogOff								

2 Test results for 2-4h:

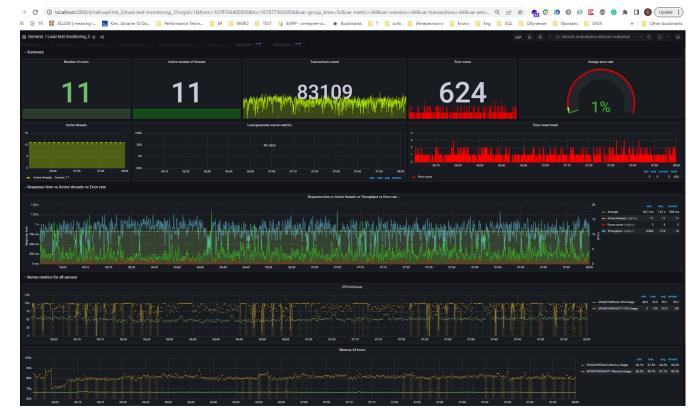




Aggregate report:

transaction	NumberOfSamples v							
Open Random post	15.63 K	153.52	593.70		4.03 K			
TC_Search by Name					3.88 K			
TC_Open Predefined Date	10.66 K	130.96	578.60					
Open first post		268.89	926.40					1.00
TC_Open Home page			505.60					
feave a comment		226.99	658.60					8.00
TC_Open Random Date			531.40					
TC_Open Large Calendar		126.92						
TC_Ad_Open Users page		262.45						9.00
TC_Ad_Open USERS menu								6.00
TC_Ad_Open Admin Page			430.00					
TC_Open Random page >1			419.60	746.95				
TC_Ed_Open Random post								
TC_Ed_Open Predefined Date		105.64						
TC_Ed_Editpost						96.00		466.00
TC_Ed_Open editpost page								
TC_Ad_Delete user					94.89 K		95.83 K	3.00
TC_Ad_Add user		454.95						31.00
TC_Open Contacts								
TC_start_Open Home page				682.45				
TC_Ad_Open login page	325.00			978.35				
TC_Ad_Open Home page	325.00		383.00					
TC_Ad_Login			543.90					
TC_Ad_LogOff	325.00		474.40					
TC_Open Random page =1								
TC_Ed_Open login page								
TC_Ed_Open Home page				268.60				
TC_Ed_Login								
TC_Ed_LogOff				388.35				
	<u> </u>						·	

2 Test results for 4-6h:

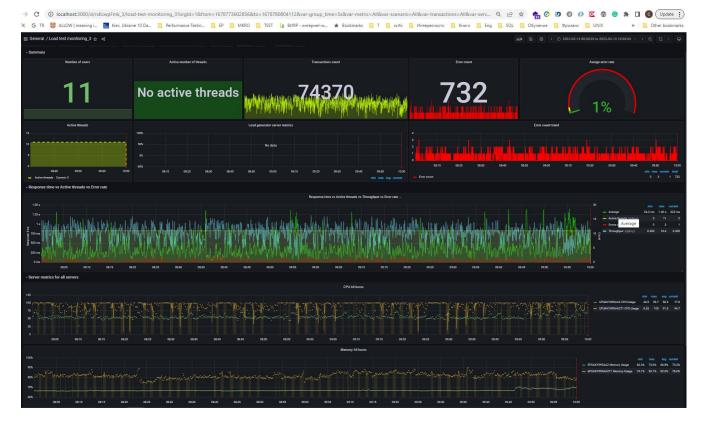




Aggregate report:

transaction								Error Count
Open Random post	14.47 K		956.20					
TC_Open Predefined Date		183.92						
TC_Search by Name								•
Open first post								
TC_Open Home page			746.30					
leave a comment		346.90						
TC_Open Random Date			702.40		3.64 K			
TC_Open Large Calendar		185.44	845.50					
TC_Ad_Open Admin Page								
TC_Ad_Open USERS menu		164.83						
TC_Ad_Open Users page		376.92						
TC_Open Random page >1								
TC_Ed_Open editpost page		249.93	900.20					
TC_Ed_Open Random post		189.42						
TC_Ed_Open Predefined Date								
TC_Ed_Editpost						88.00		569.00
TC_Ad_Delete user		548.72			89.20 K		90.05 K	3.00
TC_Ad_Add user		690.68						34.00
TC_Open Contacts								
TC_start_Open Home page	653.00	164.36	630.60					
TC_Ad_Open login page	298.00	395.64				89.00		
TC_Ad_Open Home page	298.00		644.20					
TC_Ad_Login	298.00		940.00					
TC_Ad_LogOff	298.00	190.39	688.60					
TC_Open Random page =1			393.60					
TC_Ed_Open login page			650.50					
TC_Ed_Open Home page								
TC_Ed_Login				686.50				
TC_Ed_LogOff				706.05				

2 Test results for 6-8h:





Aggregate report:

transaction								Error Count
Open Random post		299.88						
TC_Search by Name		403.83						1.00
TC_Open Predefined Date		240.90						
Open first post								
TC_Open Home page			905.40					
leave a comment		475.65					95.45 K	7.00
TC_Open Random Date		254.08						
TC_Open Large Calendar								
TC_Ad_Open Users page		483.94						6.00
TC_Ad_Open USERS menu			906.80					10.00
TC_Ad_Open Admin Page								
TC_Open Random page >1								
TC_Ed_Editpost				5.94 K	90.46 K			671.00
TC_Ed_Open Random post			878.50					
TC_Ed_Open Predefined Date								
TC_Ed_Open editpost page		304.94						
TC_Ad_Delete user								3.00
TC_Ad_Add user								34.00
TC_Open Contacts		235.60						-
TC_start_Open Home page			886.60					
TC_Ad_Open login page		464.50				89.00		
TC_Ad_Open Home page		184.07						
TC_Ad_Login			998.20					
TC_Ad_LogOff								-
TC_Open Random page +1	243.00							
TC_Ed_Open login page		365.62						
TC_Ed_Open Home page				898.05				
TC_Ed_Login			569.30	686.50				
TC_Ed_LogOff			489.90					

Links to source data:

Test	Links
fragment	
all	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1678751996856&to=1678780804112&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter_
0-2h	http://localhost:3000/d/rxKcwpFmk_3/load-test- monitoring_3?orgld=1&from=1678751996856&to=1678759198856&var-group_time=5s&var- metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var- host=All&var-measurement=jmeter
2-4h	http://localhost:3000/d/rxKcwpFmk_3/load-test- monitoring_3?orgId=1&from=1678759198856&to=1678766400856&var-group_time=5s&var- metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var- host=All&var-measurement=jmeter
4-6h	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1678766400856&to=1678773602856&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter
6-8h	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1678773602856&to=1678780804112&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter