Performance Testing Mentoring Program 2022-2023

Task 8

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1 Goal

Test the system under regular load, perform scalability testing with various hardware parameters (for virtual machine), determine KPI and calculate it.

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.

Prerequisites: previously generated 1000 posts.

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.

Approach to determine the impact of the number of CPUs on system performance:

1 Set the size of the memory as bigger as possible for the virtual machine (6Gb).

2 Scaling CPU:

- 2.1 Perform load testing for different number of CPUs: 1, 2, 3, 4, 6.
- 2.2 For each test gather all needed metrics.
- 2.3 Calculate KPI.
- 2.4 Calculate multiplier for scaling CPU.

Approach to determine the impact of the RAM on system performance:

1 Set the number of CPU as big as possible (6).

2 Scaling RAM:

- 2.1 Perform load testing for different size of RAM: 2Gb, 3Gb, 4Gb (if possible), 6Gb (if possible).
- 2.2 For each test gather all needed metrics.
- 2.3 Calculate KPI.
- 2.4 Calculate multiplier for scaling RAM.

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

Scalability testing showed that application **BlogEngine .NET 3.2 (web) does NOT scale with different amounts of RAM (2048 MB - 6144 MB)** while keeping the maximum value of CPUs (6) unchanged.

At the same time, tests have shown that application **BlogEngine .NET 3.2 (web) does noticeably scale with different amounts of CPUs (1,2,4,6)** while maintaining the same maximum RAM value (6144 MB).

The biggest impact on pct90 and average execution time of the 8 most time consuming queries was the increase from 1 to 2 cores. Query execution time decreased by 2.4 to 7.2 times.

Also, a noticeable reduction in the execution time of the 8 most time-consuming queries produced an increase from 2 to 3 in the number of cores. A further increase in the number of processor cores to 4 and 6 did not have such a significant impact.

Note: It is important to say that ITS (Internet Information Services) doesn't handle with load test with more than one CPU. IIS stops working after some time (3-5 minutes after the start of the test). The existing level of logging did not allow to identify the error that leads to this behavior. The identified errors in some cases did not lead to IIS stopping; in other cases, IIS stopped 30-40 seconds after they appeared. Our comparison based on working time when IIS continued to respond.

Error rate: The error rate generally stays under 1%, with the exception of the "Editpost" (TC_Ed_Editpost) request, which is between 19% and 53% of this type of request. The error is reproduced through the GUI while there is a load. This percentage of errors looks unacceptable in terms of user experience for the "editor" role.

	1x6Gb	2x6Gb	3x6Gb	4x6Gb	6x6Gb	6x2Gb	6x3Gb	6x4Gb	6x6Gb
Error rate TC_Ed_Editpost	19%	32%	34%	35%	53%	27%	52%	46%	53%
Error rate leave a comment	0.5%	0.7%	0.5%	1.0%	1.6%	0.9%	1.5%	1.3%	1.6%
Error rate TC_Open Predefined Date	-	0.0%	-	0.1%	0.3%	0.1%	0.1%	0.1%	0.3%
Error rate TC_Search by Name	-	-	0.1%	-	-	-	-	0.1%	-
Error rate Open first post	-	0.0%	0.1%	-	-	-	0.2%	0.1%	-
Error rate TC_Open Random page =1	-	-	-	-	-	-	-	1.4%	-
Error rate TC_Open Large Calendar	-	-	-	0.2%	-	-	0.2%	0.1%	-
Error rate TC_Ad_Open USERS menu	-	-	-	-	-	-	0.5%	0.4%	-
Error rate Open Random post	-	-	0.1%	0.1%	0.1%	-	0.1%	0.0%	0.1%
Error rate TC_start_Open Home page	-	-	-	-	-	-	-	0.3%	-
Error rate TC_Open Random page >1	-	-	-	-	-	-	-	0.1%	-

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

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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

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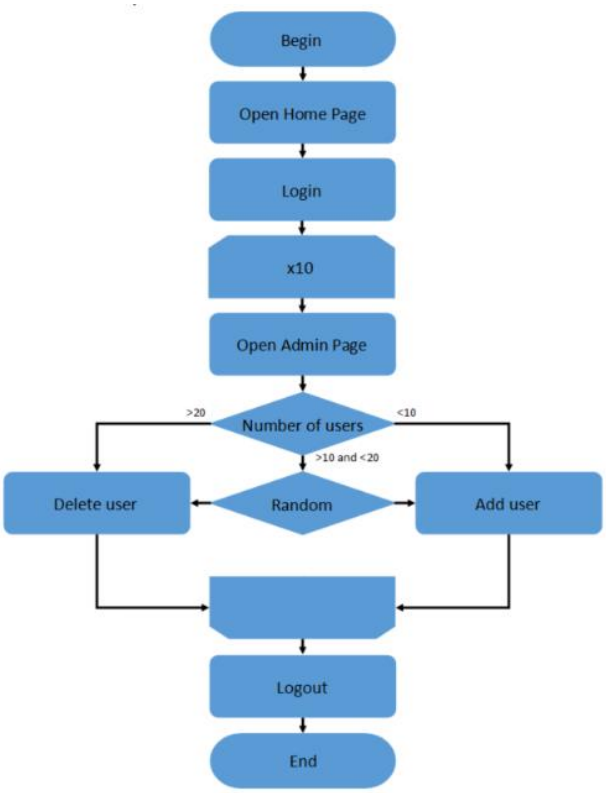
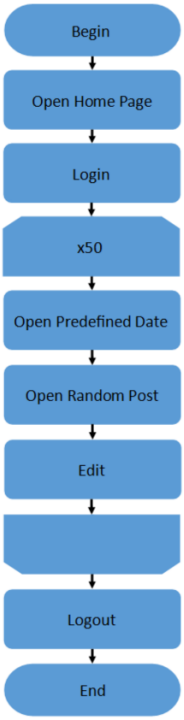
5. Admin script

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.



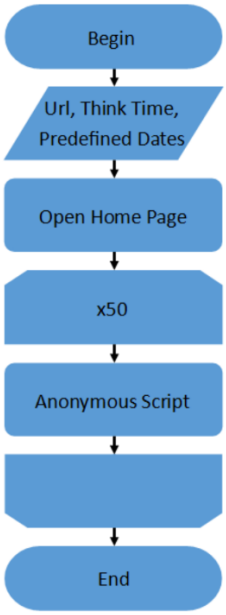
6. Editor script

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%

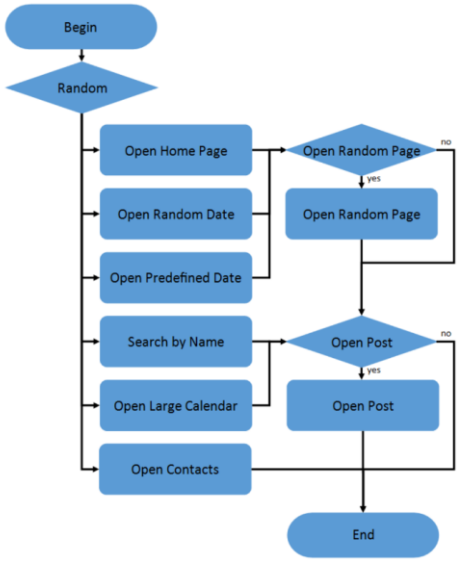
4. Search by Name: 30%

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).

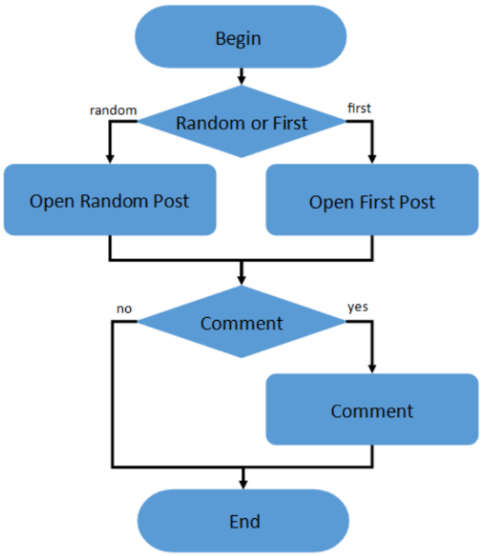
Step 3. After Step 2 (or after Step 1 if there was no opened one of the first three pages) make a decision to open or not to open a post with 80% / 20% probabilities.



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

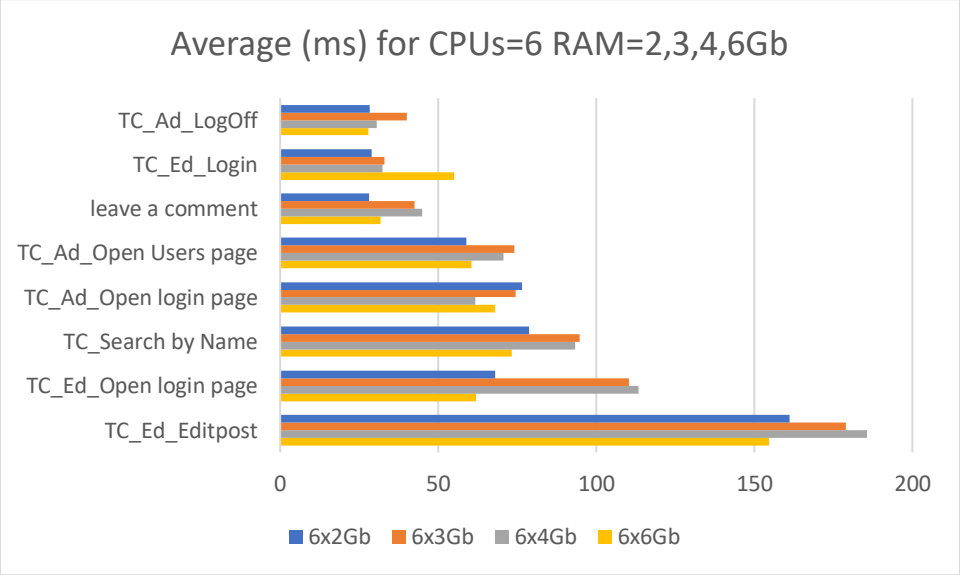
1 Scalability testing showed that application **BlogEngine .NET 3.2 (web) does NOT scale with different amounts of RAM (2048 MB - 6144 MB)** while keeping the maximum value of CPUs (6) unchanged.

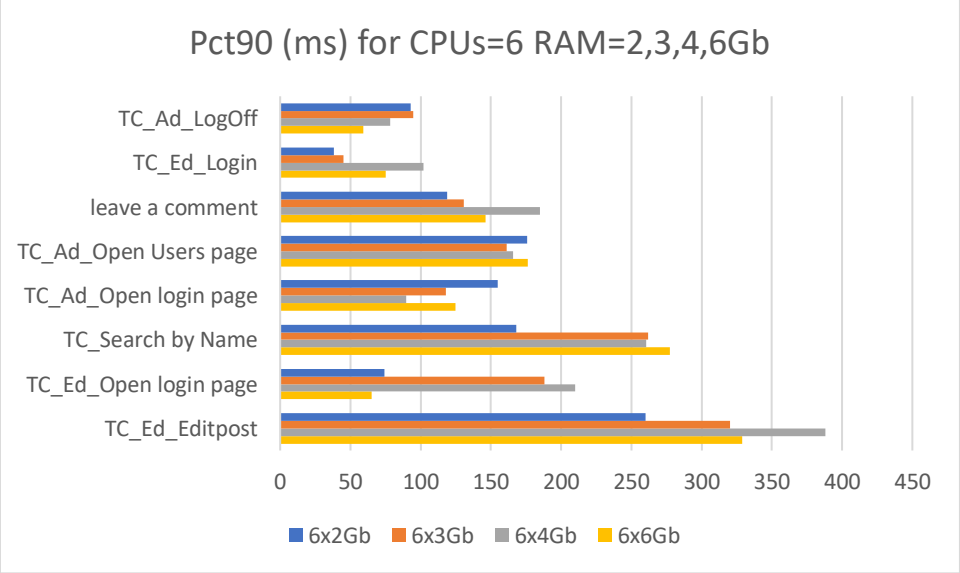
As we can see the average throughput has remained stable between 37 and 40 rps. as well as the average CPU usage which remained in the range of 30-36%. The average value of Memory usage decreased with the addition of RAM, but not as dramatically as RAM was added.

Performance Indicators	6x2Gb	6x3Gb	6x4Gb	6x6Gb
Throughput max (rps)	46	44	46	44
Throughput avg (rps)	**38**	**37**	**40**	**37**
CPU usage max (%)	48	50	83	88
CPU usage avg (%)	**30**	**33**	**36**	**30**
Memory usage max (%)	90	81	75	56
Memory usage avg (%)	**89**	**77**	**68**	**51**
IIS stopped during the test	Y	**Y**	**N**	**Y**
An effective duration of test (sec)	222	331	**906**	178
Transactions count	8264	12233	35976	6398
Error count	28	78	195	40
Averge error rate (%)	**0.3**	**0.6**	**0.5**	**0.6**

The average execution time of the 8 most time-consuming queries also did not change significantly, as did the pct90 value for such queries.

Response time:





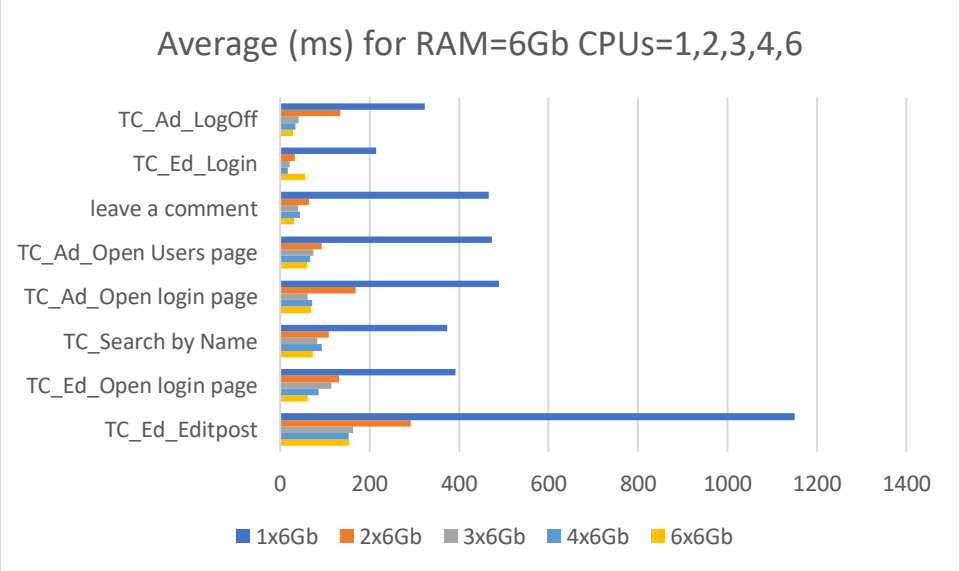
2 At the same time, tests have shown that application **BlogEngine .NET 3.2 (web) does noticeably scale with different amounts of CPUs (1,2,4,6)** while maintaining the same maximum RAM value (6144 MB).

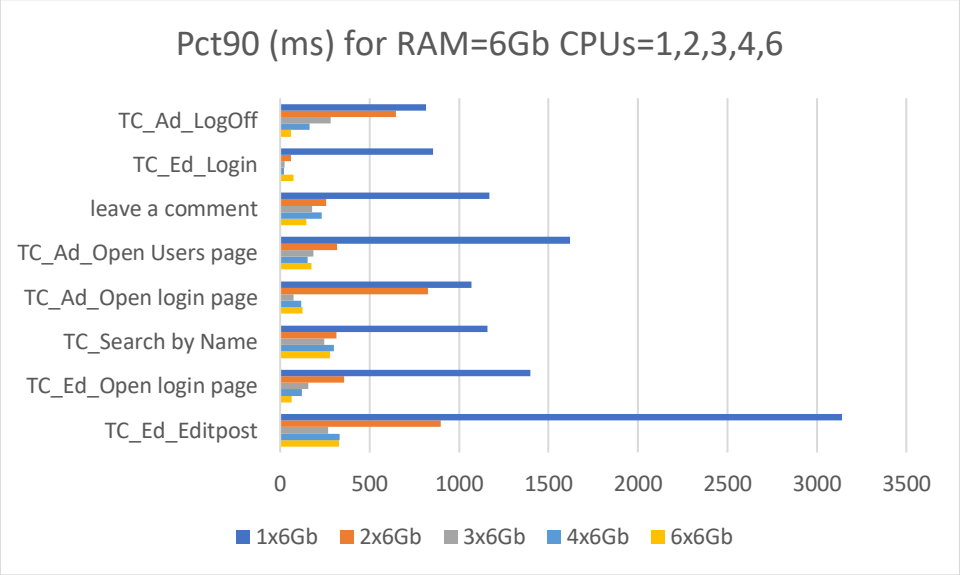
As we see the average throughput increased by a third from 29 to 39 rps. already with an increase in the number of cores more than one. And the average CPU usage dropped from a critical 96% to 78%. The average value of Memory usage did not change and remained within 50-53%.

Performance Indicators	**1x6Gb**	**2x6Gb**	**3x6Gb**	**4x6Gb**	**6x6Gb**
Throughput max (rps)	42	47	44	46	44
Throughput avg (rps)	**29**	**39**	**38**	**39**	**37**
CPU usage max (%)	100	100	72	79	88
CPU usage avg (%)	**96**	**78**	**52**	**48**	**30**
Memory usage max (%)	55	52	58	57	56
Memory usage avg (%)	**51**	**50**	**53**	**53**	**51**
IIS stopped during the test	**N**	**Y**	**Y**	**Y**	**Y**
An effective duration of test (sec)	**909**	589	249	319	178
Transactions count	19970	22922	9260	12227	6398
Error count	86	78	34	56	40
Averge error rate (%)	**0.4**	**0.3**	**0.4**	**0.5**	**0.6**

The biggest impact on pct90 and average execution time of the 8 most time consuming queries was the increase from 1 to 2 cores. Query execution time decreased by 2.4 to 7.2 times.

Response time:

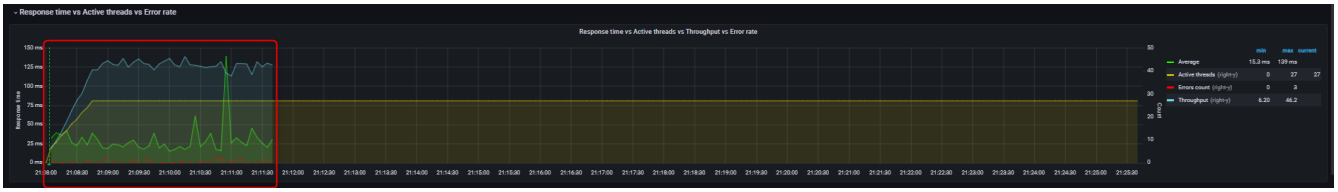




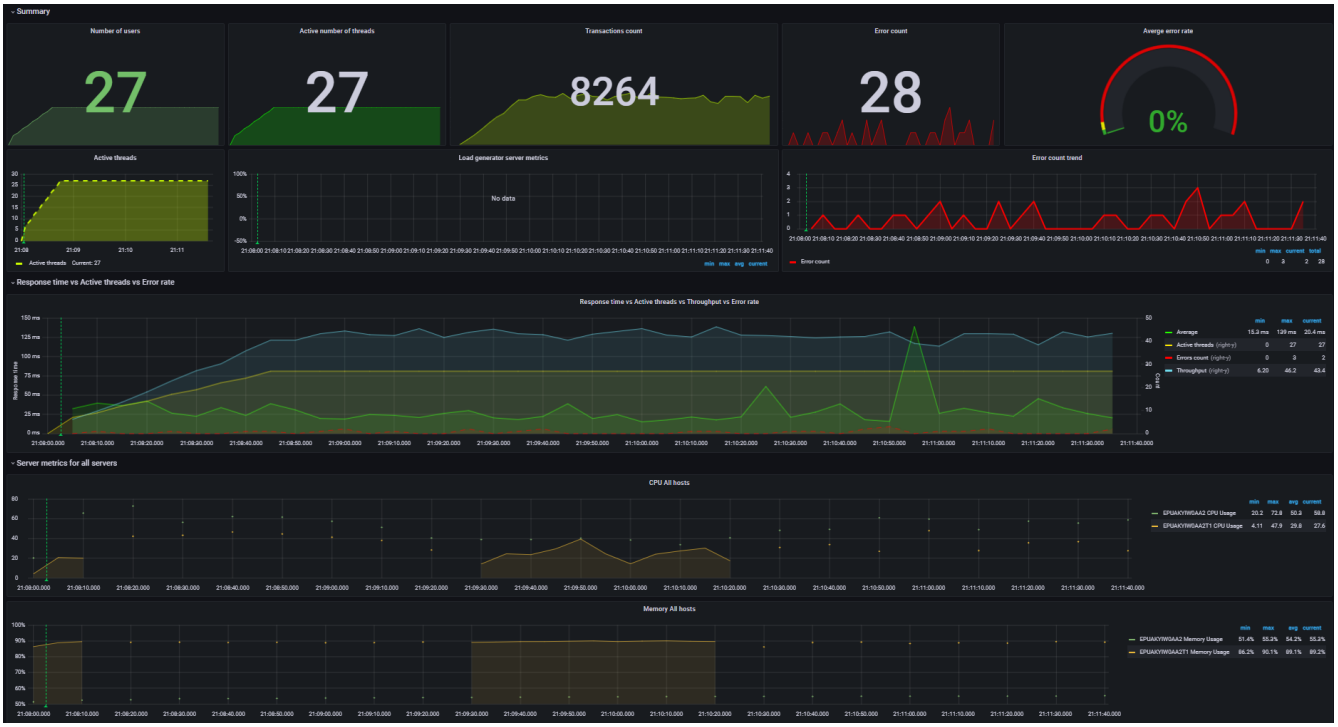
Also, a noticeable reduction in the execution time of the 8 most time-consuming queries produced an increase from 2 to 3 in the number of cores. A further increase in the number of processor cores to 4 and 6 did not have such a significant impact.

9 Detailed test results

1 **Test results with RAM 2GB while keeping the maximum value of CPUs (6) unchanged:**



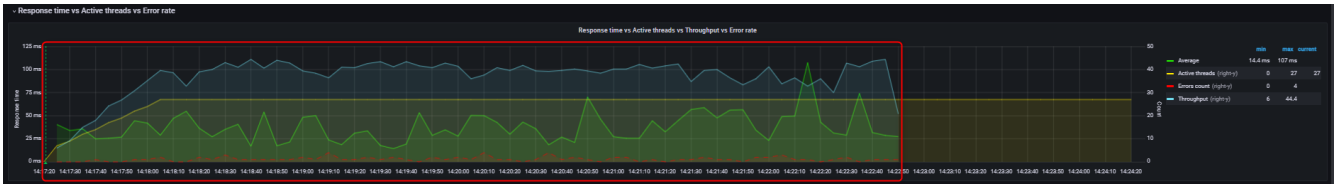
Response time vs Active threads vs Throughput vs Error rate graph:



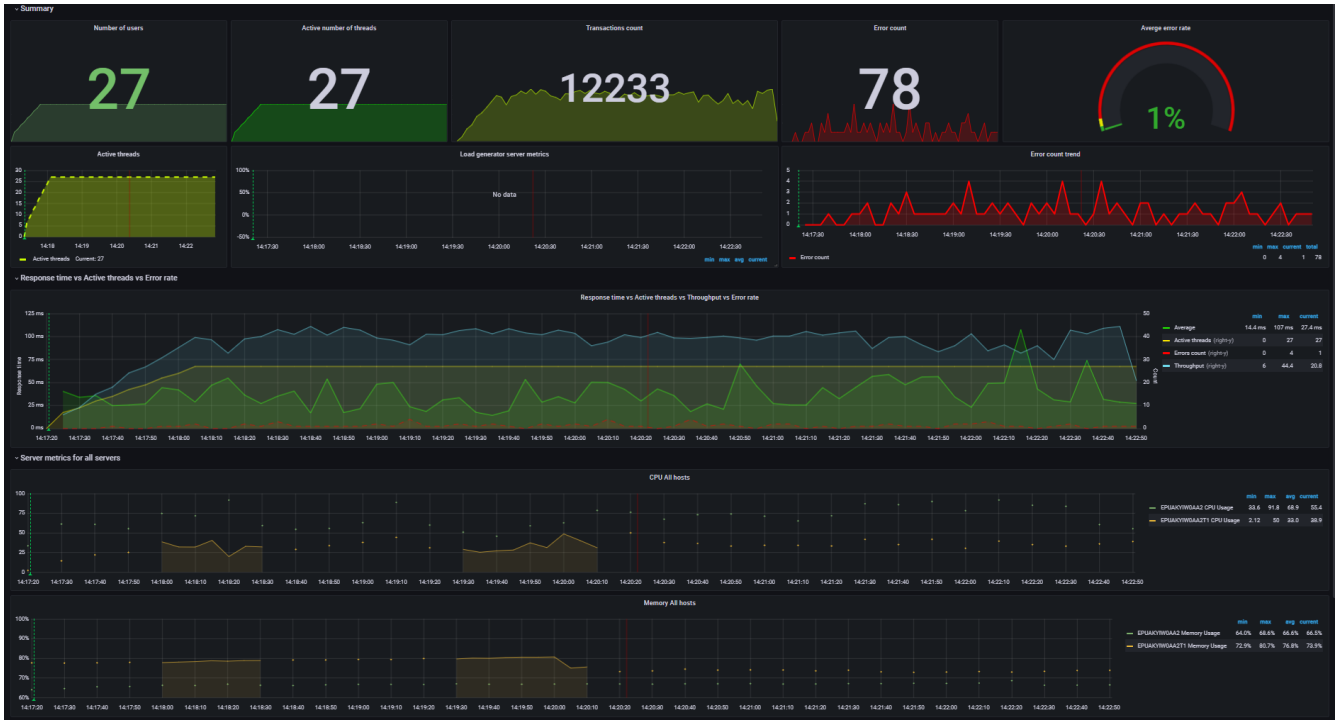
Aggregate report:

transaction	NumberOfSamples	Average	pct90	pct95	pct99	Min	Max	Error Count
TC_start_Open Home page	91.00	20.58	47.40	85.00	92.00	7.00	92.00	-
TC_Search by Name	1.18 K	78.73	168.10	412.75	726.80	4.00	727.00	-
TC_Open Random page +1	318.00	15.74	26.10	47.00	156.28	6.00	157.00	-
TC_Open Random page +1	40.00	14.51	43.10	44.00	44.00	6.00	44.00	-
TC_Open Large Calendar	382.00	17.44	48.40	67.90	637.64	7.00	643.00	-
TC_Open Home page	594.00	21.13	66.40	97.85	562.82	6.00	563.00	-
TC_Open Contacts	146.00	11.49	24.00	38.90	65.00	5.00	65.00	-
TC_Ed_Open login page	2.00	68.00	74.00	74.00	74.00	62.00	74.00	-
TC_Ed_Open editpost page	75.00	8.18	15.80	18.35	35.00	3.00	35.00	-
TC_Ed_Open Random post	76.00	19.07	44.50	48.00	51.00	7.00	51.00	-
TC_Ed_Open Predefined Date	76.00	15.98	26.10	27.90	631.00	7.00	631.00	-
TC_Ed_Open Home page	2.00	18.00	22.00	22.00	22.00	14.00	22.00	-
TC_Ed_Login	2.00	29.00	38.00	38.00	38.00	20.00	38.00	-
TC_Ad_Open login page	12.00	76.57	155.00	155.00	155.00	42.00	155.00	-
TC_Ad_Open Users page	120.00	59.00	175.60	282.00	282.00	12.00	282.00	-
TC_Ad_Open USERS menu	120.00	6.62	14.70	27.00	48.00	2.00	48.00	-
TC_Ad_Open Home page	13.00	19.89	38.00	38.00	38.00	7.00	38.00	-
TC_Ad_Open Admin Page	120.00	4.80	10.80	14.00	192.00	1.00	192.00	-
TC_Ad_Login	12.00	29.75	49.00	71.00	71.00	15.00	71.00	-
TC_Ad_LogOff	11.00	28.28	93.00	93.00	93.00	10.00	93.00	-
TC_Ad_Delete user	58.00	17.93	26.00	109.00	610.00	6.00	610.00	-
Open first post	888.00	22.39	53.00	152.00	711.56	6.00	717.00	-
Open Random post	1.71 K	21.34	57.20	119.50	566.33	5.00	568.00	-
TC_Ed_Editpost	74.00	161.18	260.30	326.40	758.00	22.00	758.00	20.00
leave a comment	539.00	28.08	118.80	316.00	826.51	5.00	827.00	5.00
TC_Open Random Date	373.00	15.19	42.80	60.40	94.78	5.00	95.00	1.00
TC_Open Predefined Date	1.16 K	16.03	35.00	66.25	516.84	5.00	518.00	1.00
TC_Ad_Add user	61.00	25.06	85.90	143.15	415.00	7.00	415.00	1.00

2 **Test results with RAM 3GB while keeping the maximum value of CPUs (6) unchanged:**



Response time vs Active threads vs Throughput vs Error rate graph:

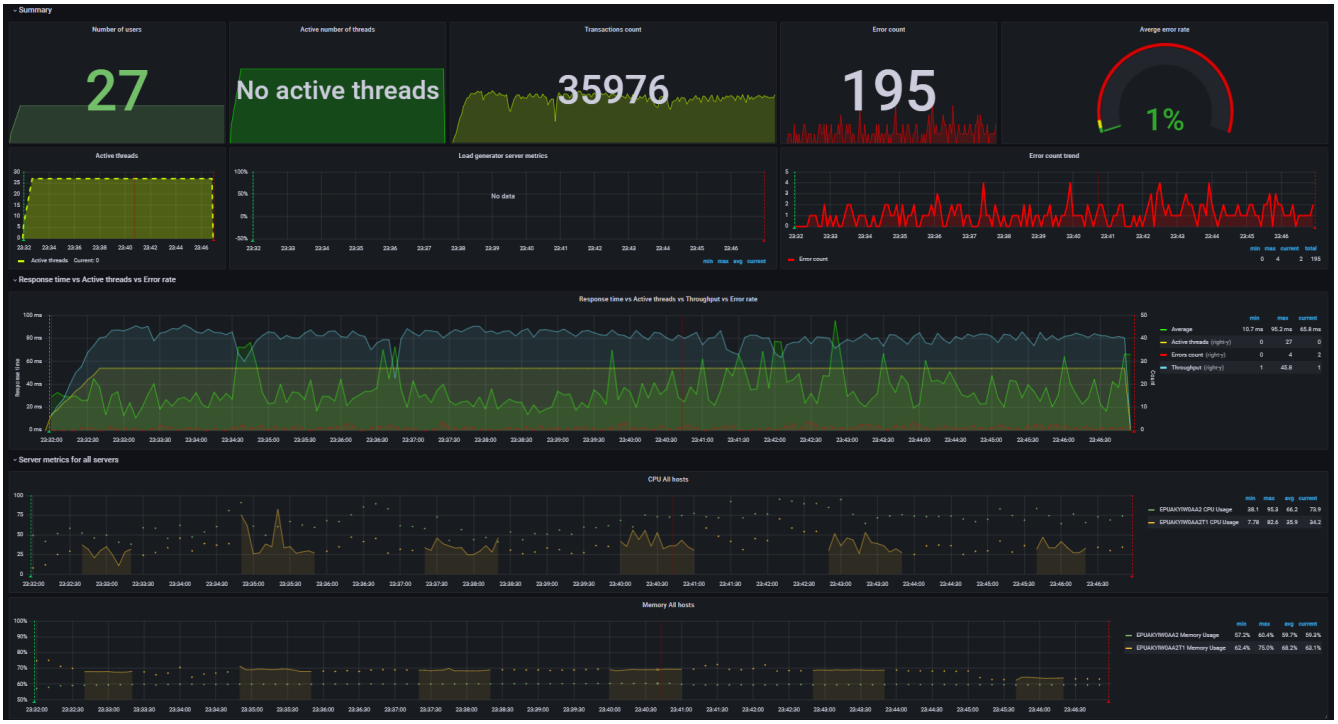


Aggregate report:

transaction	NumberOfSamples	Average	pct90	pct95	pct99	Min	Max	Error Count
TC_start_Open Home page	125.00	22.41	46.50	55.90	180.63	8.00	181.00	-
TC_Search by Name	1.70 K	94.66	261.70	357.20	464.56	7.00	465.00	-
TC_Open Random page >1	447.00	23.51	45.80	65.95	175.69	8.00	176.00	-
TC_Open Random page =1	50.00	24.85	65.00	65.00	66.00	8.00	66.00	-
TC_Open Random Date	584.00	21.72	46.70	81.45	216.74	7.00	217.00	-
TC_Open Contacts	242.00	20.55	44.90	82.40	166.00	6.00	166.00	-
TC_Ed_Open login page	4.00	110.28	188.00	188.00	188.00	65.00	188.00	-
TC_Ed_Open editpost page	110.00	13.52	23.90	52.00	95.00	5.00	95.00	-
TC_Ed_Open Random post	111.00	22.62	38.00	60.00	112.00	9.00	147.00	-
TC_Ed_Open Predefined Date	111.00	20.26	53.00	63.00	141.00	8.00	141.00	-
TC_Ed_Open Home page	4.00	31.39	46.00	46.00	46.00	23.00	46.00	-
TC_Ed_Login	4.00	33.00	45.00	45.00	45.00	17.00	45.00	-
TC_Ed_LogOff	2.00	33.50	56.00	56.00	56.00	26.00	56.00	-
TC_Ad_Open login page	19.00	74.48	118.00	119.00	119.00	48.00	119.00	-
TC_Ad_Open Users page	182.00	74.03	161.00	307.75	418.86	15.00	419.00	-
TC_Ad_Open Home page	19.00	20.85	57.60	73.00	73.00	12.00	73.00	-
TC_Ad_Open Admin Page	182.00	6.01	13.90	26.90	121.67	2.00	122.00	-
TC_Ad_Login	19.00	37.12	99.80	129.00	129.00	21.00	129.00	-
TC_Ad_LogOff	17.00	40.11	94.60	97.00	97.00	16.00	97.00	-
TC_Ad_Delete user	87.00	17.14	30.00	40.95	216.00	7.00	216.00	-
TC_Ad_Add user	94.00	24.07	48.00	55.00	190.00	11.00	190.00	-
TC_Ed_Editpost	110.00	178.95	320.00	397.90	625.00	18.00	625.00	57.00
leave a comment	812.00	42.42	130.90	270.00	762.45	5.00	767.00	12.00
Open first post	1.36 K	26.93	54.90	112.00	290.39	6.00	292.00	3.00
Open Random post	2.50 K	27.25	74.50	157.70	460.80	8.00	465.00	2.00
TC_Open Predefined Date	1.72 K	21.85	53.70	103.75	296.82	5.00	298.00	1.00
TC_Open Large Calendar	587.00	23.90	52.80	87.70	200.00	7.00	200.00	1.00
TC_Open Home page	856.00	23.74	51.90	82.40	136.61	6.00	137.00	1.00
TC_Ad_Open USERS menu	182.00	7.49	15.00	18.90	262.01	3.00	264.00	1.00

3 **Test results with RAM 4GB while keeping the maximum value of CPUs (6) unchanged:**

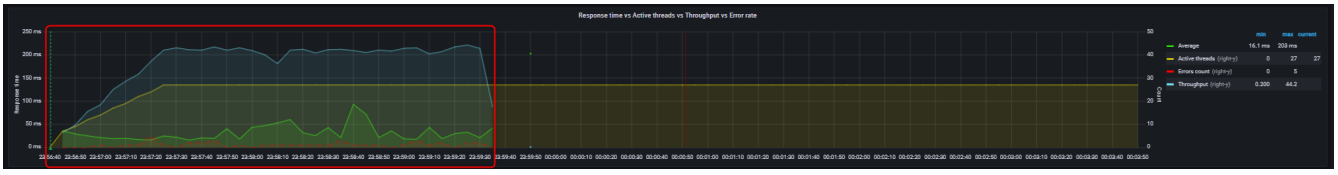
Response time vs Active threads vs Throughput vs Error rate graph:



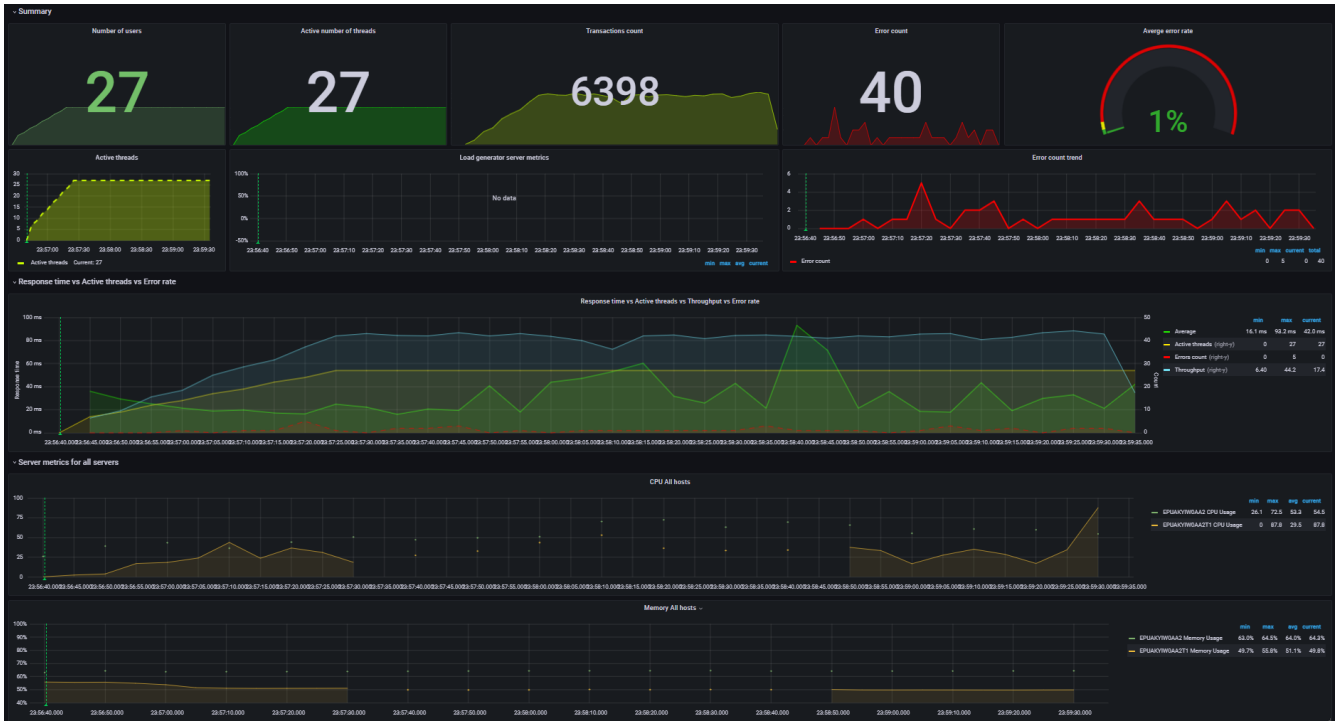
Aggregate report:

transaction	NumberOfSamples	Average	pct90	pct95	pct99	Min	Max	Error Count
TC_Open Random Date	1.73 K	17.60	38.40	75.30	201.00	4.00	201.00	-
TC_Open Home page	2.49 K	20.78	43.70	73.90	173.44	0.00	174.00	-
TC_Open Contacts	675.00	17.09	44.10	69.85	329.17	0.00	331.00	-
TC_Ed_Open login page	8.00	113.46	210.00	210.00	210.00	57.00	210.00	-
TC_Ed_Open editpost page	312.00	10.87	23.80	39.80	83.93	4.00	84.00	-
TC_Ed_Open Random post	312.00	22.33	41.80	176.00	266.00	7.00	266.00	-
TC_Ed_Open Predefined Date	313.00	17.83	36.60	55.60	122.64	0.00	123.00	-
TC_Ed_Open Home page	8.00	15.71	31.00	31.00	31.00	10.00	31.00	-
TC_Ed_Login	8.00	32.43	102.00	102.00	102.00	16.00	102.00	-
TC_Ed_LogOff	6.00	20.77	28.00	28.00	28.00	15.00	28.00	-
TC_Ad_Open login page	52.00	61.73	89.60	115.75	150.00	43.00	150.00	-
TC_Ad_Open Users page	507.00	70.70	165.80	210.00	1.61 K	13.00	1.62 K	-
TC_Ad_Open Home page	52.00	17.23	33.70	40.00	70.00	8.00	70.00	-
TC_Ad_Open Admin Page	507.00	4.85	12.00	18.90	97.51	1.00	98.00	-
TC_Ad_Login	52.00	28.34	64.70	103.50	153.00	13.00	153.00	-
TC_Ad_LogOff	50.00	30.47	78.20	86.00	114.00	10.00	114.00	-
TC_Ad_Delete user	252.00	20.84	38.40	195.00	356.00	7.00	356.00	-
TC_Ad_Add user	254.00	23.80	46.60	75.35	296.00	0.00	296.00	-
TC_Ed_Editpost	312.00	185.57	388.00	422.70	555.88	14.00	1.79 K	144.00
leave a comment	2.23 K	44.86	184.90	353.60	1.56 K	3.00	1.57 K	29.00
TC_Open Predefined Date	5.21 K	18.31	41.00	84.90	364.97	0.00	365.00	5.00
TC_Search by Name	5.07 K	93.24	260.40	407.40	649.94	0.00	650.00	4.00
Open first post	3.96 K	28.35	75.80	114.95	380.71	3.00	383.00	3.00
TC_Open Random page +1	146.00	20.30	50.60	80.00	115.00	7.00	115.00	2.00
TC_Open Large Calendar	1.77 K	20.59	46.90	89.60	422.96	0.00	426.00	2.00
TC_Ad_Open USERS menu	507.00	7.29	15.00	34.40	159.33	3.00	160.00	2.00
Open Random post	7.44 K	23.74	57.60	104.30	1.11 K	4.00	1.12 K	2.00
TC_start_Open Home page	355.00	21.77	55.70	80.85	167.72	8.00	168.00	1.00
TC_Open Random page >1	1.40 K	21.56	46.90	108.20	252.15	6.00	253.00	1.00

4 **Test results with RAM 6GB while keeping the maximum value of CPUs (6) unchanged:**



Response time vs Active threads vs Throughput vs Error rate graph:

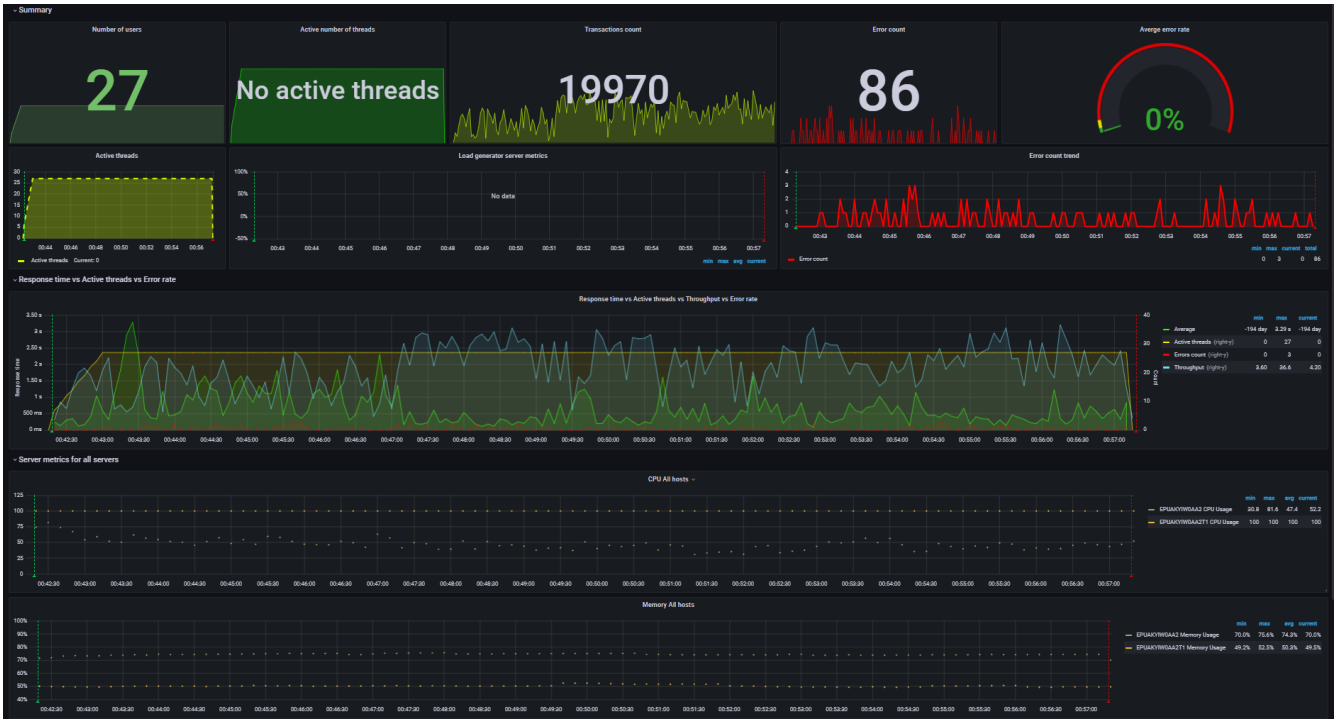


Aggregate report:

transaction	NumberOfSamples	Average	pct90	pct95	pct99	Min	Max	Error Count
TC_start_Open Home page	71.00	17.26	41.20	55.60	96.00	9.00	96.00	-
TC_Search by Name	952.00	73.29	277.40	331.75	508.38	6.00	509.00	-
TC_Open Random page >1	245.00	19.22	40.90	102.10	249.74	8.00	250.00	-
TC_Open Random page =1	20.00	12.13	20.60	21.00	21.00	7.00	21.00	-
TC_Open Random Date	293.00	15.79	27.90	36.95	342.50	5.00	343.00	-
TC_Open Large Calendar	327.00	16.79	29.90	56.10	265.20	7.00	266.00	-
TC_Open Home page	463.00	20.38	52.10	85.50	298.23	7.00	300.00	-
TC_Open Contacts	130.00	26.47	210.00	210.00	210.00	6.00	210.00	-
TC_Ed_Open login page	2.00	62.00	65.00	65.00	65.00	59.00	65.00	-
TC_Ed_Open editpost page	58.00	15.99	22.80	178.60	408.00	4.00	408.00	-
TC_Ed_Open Random post	58.00	24.37	72.40	82.00	82.00	10.00	82.00	-
TC_Ed_Open Predefined Date	58.00	13.74	26.00	27.50	71.00	7.00	71.00	-
TC_Ed_Open Home page	2.00	18.00	26.00	26.00	26.00	10.00	26.00	-
TC_Ed_Login	2.00	55.00	75.00	75.00	75.00	35.00	75.00	-
TC_Ad_Open login page	11.00	68.09	125.00	125.00	125.00	42.00	125.00	-
TC_Ad_Open Users page	99.00	60.43	176.40	238.00	528.00	13.00	528.00	-
TC_Ad_Open USERS menu	100.00	5.52	16.10	17.00	53.00	2.00	53.00	-
TC_Ad_Open Home page	11.00	13.54	28.80	30.00	30.00	8.00	30.00	-
TC_Ad_Open Admin Page	100.00	4.25	8.70	21.75	30.98	2.00	31.00	-
TC_Ad_Login	10.00	31.79	51.00	51.00	51.00	18.00	51.00	-
TC_Ad_LogOff	9.00	27.88	59.00	59.00	59.00	13.00	59.00	-
TC_Ad_Delete user	52.00	16.16	47.00	185.05	205.00	8.00	205.00	-
TC_Ad_Add user	47.00	19.83	39.40	50.50	52.00	10.00	52.00	-
Open first post	678.00	26.04	72.60	118.90	554.73	7.00	557.00	-
TC_Ed_Editpost	57.00	154.66	329.00	398.50	441.00	24.00	441.00	30.00
leave a comment	377.00	31.84	146.20	323.00	620.68	4.00	624.00	6.00
TC_Open Predefined Date	873.00	16.75	36.00	127.15	305.98	5.00	306.00	3.00
Open Random post	1.29 K	26.96	102.30	248.65	481.75	7.00	482.00	1.00

5 **Test results with 1 CPU while maintaining the same maximum RAM value (6144 MB):**

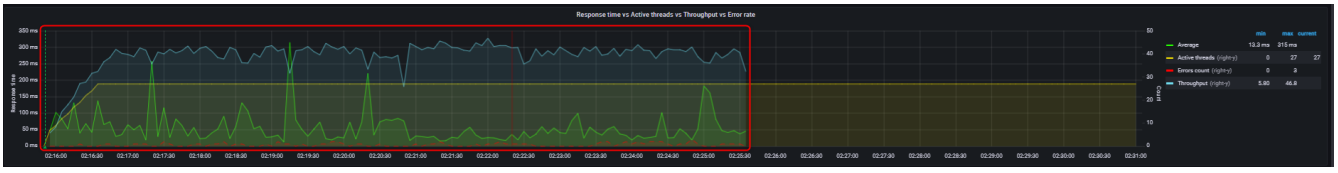
Response time vs Active threads vs Throughput vs Error rate graph:



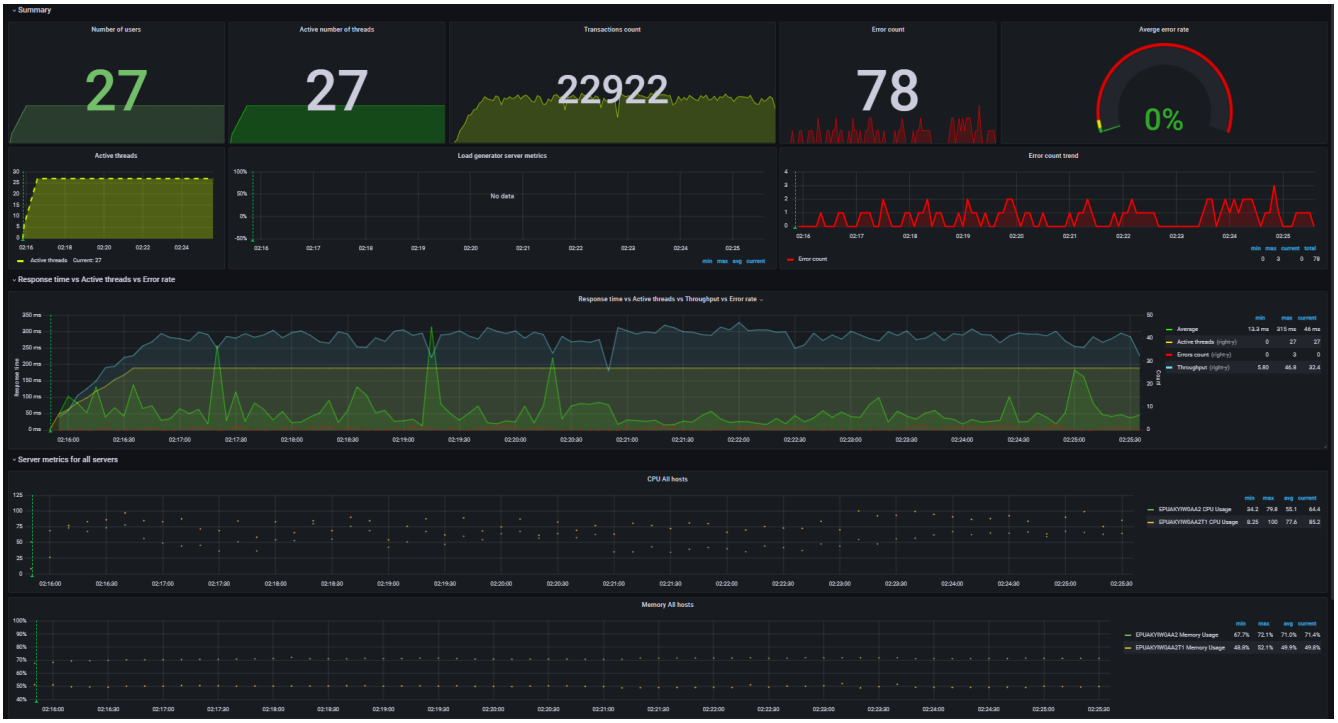
Aggregate report:

transaction	NumberOfSamples	Average	pct90	pct95	pct99	Min	Max	Error Count
TC_start_Open Home page	204.00	-470.56 Mil	1.92 K	2.38 K	6.06 K	-1.68 Tri	6.06 K	-
TC_Search by Name	2.84 K	705.04	3.10 K	3.96 K	6.45 K	0.00	6.45 K	-
TC_Open Random page >1	784.00	482.23	2.22 K	2.71 K	5.96 K	12.00	5.96 K	-
TC_Open Random page <1	93.00	526.43	1.64 K	3.51 K	4.52 K	11.00	4.52 K	-
TC_Open Large Calendar	910.00	400.52	1.43 K	2.55 K	4.53 K	0.00	4.53 K	-
TC_Open Home page	1.47 K	473.01	2.19 K	3.22 K	5.89 K	10.00	5.90 K	-
TC_Open Contacts	393.00	463.98	1.62 K	2.93 K	5.59 K	9.00	5.59 K	-
TC_Ed_Open login page	4.00	352.25	627.00	627.00	627.00	82.00	627.00	-
TC_Ed_Open Random post	191.00	448.17	1.95 K	2.96 K	3.04 K	14.00	3.04 K	-
TC_Ed_Open Predefined Date	191.00	442.86	1.93 K	3.40 K	3.55 K	15.00	3.55 K	-
TC_Ed_Open Home page	4.00	602.81	2.40 K	2.40 K	2.40 K	134.00	2.40 K	-
TC_Ed_Login	4.00	302.98	894.00	894.00	894.00	36.00	894.00	-
TC_Ed_LogOff	2.00	150.25	337.00	337.00	337.00	88.00	337.00	-
TC_Ad_Open login page	25.00	879.50	3.65 K	3.65 K	3.65 K	100.00	3.65 K	-
TC_Ad_Open Users page	243.00	876.86	3.02 K	3.77 K	5.62 K	33.00	5.62 K	-
TC_Ad_Open Home page	25.00	816.64	3.09 K	3.09 K	3.09 K	30.00	3.09 K	-
TC_Ad_Open Admin Page	244.00	456.59	1.64 K	2.86 K	4.43 K	3.00	4.43 K	-
TC_Ad_Login	25.00	736.21	2.45 K	2.45 K	2.45 K	38.00	2.45 K	-
TC_Ad_LogOff	23.00	1.26 K	4.23 K	4.23 K	4.23 K	72.00	4.23 K	-
Open first post	2.19 K	521.70	2.33 K	3.27 K	6.22 K	10.00	6.24 K	-
TC_Ed_Editpost	191.00	2.43 K	6.56 K	10.18 K	10.63 K	0.00	10.63 K	66.00
leave a comment	1.29 K	868.90	4.08 K	6.41 K	12.66 K	10.00	12.66 K	10.00
TC_Ad_Add user	115.00	1.75 K	6.14 K	6.99 K	6.99 K	25.00	6.99 K	3.00
TC_Open Predefined Date	2.86 K	472.07	2.23 K	3.30 K	5.82 K	0.00	5.82 K	2.00
TC_Open Random Date	944.00	517.17	2.07 K	3.93 K	4.55 K	0.00	4.57 K	1.00
TC_Ed_Open editpost page	191.00	778.70	3.14 K	6.12 K	6.41 K	29.00	6.41 K	1.00
TC_Ad_Open USERS menu	244.00	379.64	1.22 K	1.73 K	4.24 K	0.00	4.24 K	1.00
TC_Ad_Delete user	128.00	2.48 K	8.83 K	35.40 K	39.92 K	14.00	39.92 K	1.00
Open Random post	4.13 K	541.27	2.34 K	4.32 K	5.92 K	11.00	5.92 K	1.00

6 **Test results with 2 CPUs while maintaining the same maximum RAM value (6144 MB):**



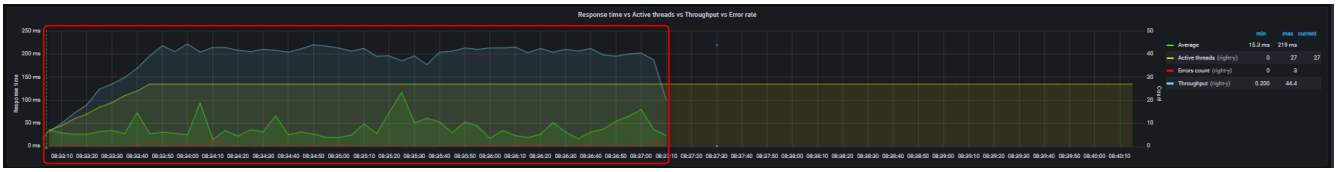
Response time vs Active threads vs Throughput vs Error rate graph:



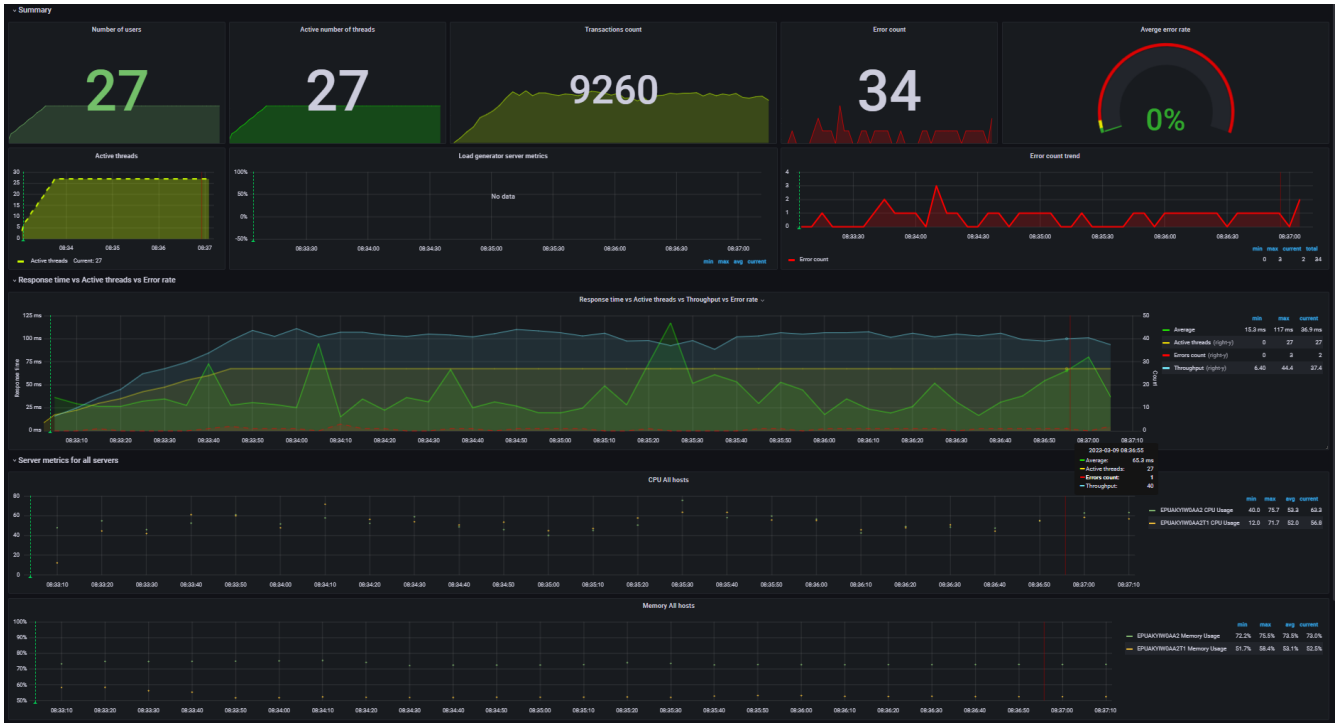
Aggregate report:

transaction	NumberOfSamples	Average	pct90	pct95	pct99	Min	Max	Error Count
TC_start_Open Home page	230.00	50.83	243.60	678.80	957.00	7.00	957.00	-
TC_Search by Name	3.28 K	109.22	315.30	541.15	1.66 K	6.00	1.66 K	-
TC_Open Random page >1	898.00	33.88	96.60	204.85	525.00	7.00	528.00	-
TC_Open Random page =1	83.00	77.58	489.00	1.05 K	1.05 K	7.00	1.05 K	-
TC_Open Random Date	1.07 K	45.03	152.00	481.80	910.32	5.00	913.00	-
TC_Open Large Calendar	1.07 K	39.77	141.60	221.75	1.40 K	6.00	1.40 K	-
TC_Open Home page	1.65 K	41.02	137.20	487.45	1.38 K	6.00	1.38 K	-
TC_Open Contacts	393.00	46.92	210.30	653.95	1.05 K	5.00	1.05 K	-
TC_Ed_Open login page	5.00	131.49	356.00	356.00	356.00	63.00	356.00	-
TC_Ed_Open editpost page	199.00	57.50	205.00	597.00	1.51 K	4.00	1.52 K	-
TC_Ed_Open Random post	199.00	41.98	163.40	672.00	672.00	8.00	672.00	-
TC_Ed_Open Predefined Date	199.00	32.35	86.80	169.00	258.28	6.00	259.00	-
TC_Ed_Open Home page	5.00	47.58	71.00	71.00	71.00	14.00	71.00	-
TC_Ed_Login	5.00	33.17	59.00	59.00	59.00	17.00	59.00	-
TC_Ed_LogOff	3.00	24.83	29.00	29.00	29.00	18.00	29.00	-
TC_Ad_Open login page	32.00	168.15	825.00	825.00	825.00	45.00	825.00	-
TC_Ad_Open Users page	317.00	92.42	317.50	476.20	1.07 K	13.00	1.07 K	-
TC_Ad_Open USERS menu	317.00	32.49	138.80	240.00	1.57 K	2.00	1.59 K	-
TC_Ad_Open Home page	32.00	47.63	283.00	283.00	283.00	7.00	283.00	-
TC_Ad_Open Admin Page	317.00	18.16	64.10	130.00	414.36	2.00	417.00	-
TC_Ad_Login	32.00	69.15	218.00	218.00	218.00	16.00	218.00	-
TC_Ad_LogOff	30.00	134.54	648.00	678.60	716.00	10.00	716.00	-
TC_Ad_Delete user	160.00	73.00	386.80	450.95	1.10 K	6.00	1.10 K	-
TC_Ed_Editpost	197.00	291.39	898.00	1.20 K	1.25 K	13.00	1.25 K	63.00
leave a comment	1.47 K	64.77	258.50	640.25	1.45 K	5.00	1.46 K	10.00
TC_Ad_Add user	156.00	126.93	731.00	758.00	1.42 K	8.00	1.43 K	2.00
TC_Open Predefined Date	3.26 K	37.83	137.70	445.40	1.47 K	3.00	1.47 K	1.00
Open first post	2.50 K	49.75	189.40	411.00	1.55 K	7.00	1.55 K	1.00
Open Random post	4.82 K	40.89	167.80	392.40	1.58 K	3.00	1.59 K	1.00

7 **Test results with 3 CPUs while maintaining the same maximum RAM value (6144 MB):**



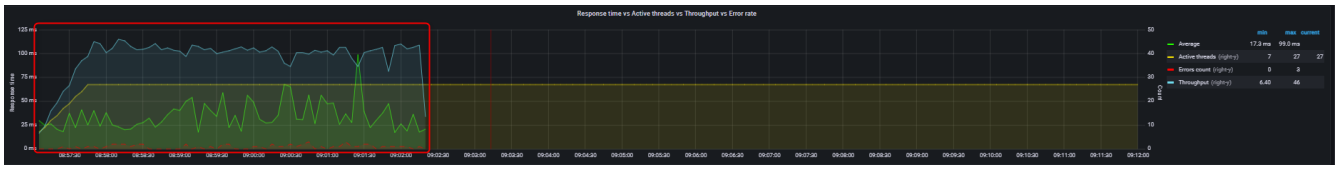
Response time vs Active threads vs Throughput vs Error rate graph:



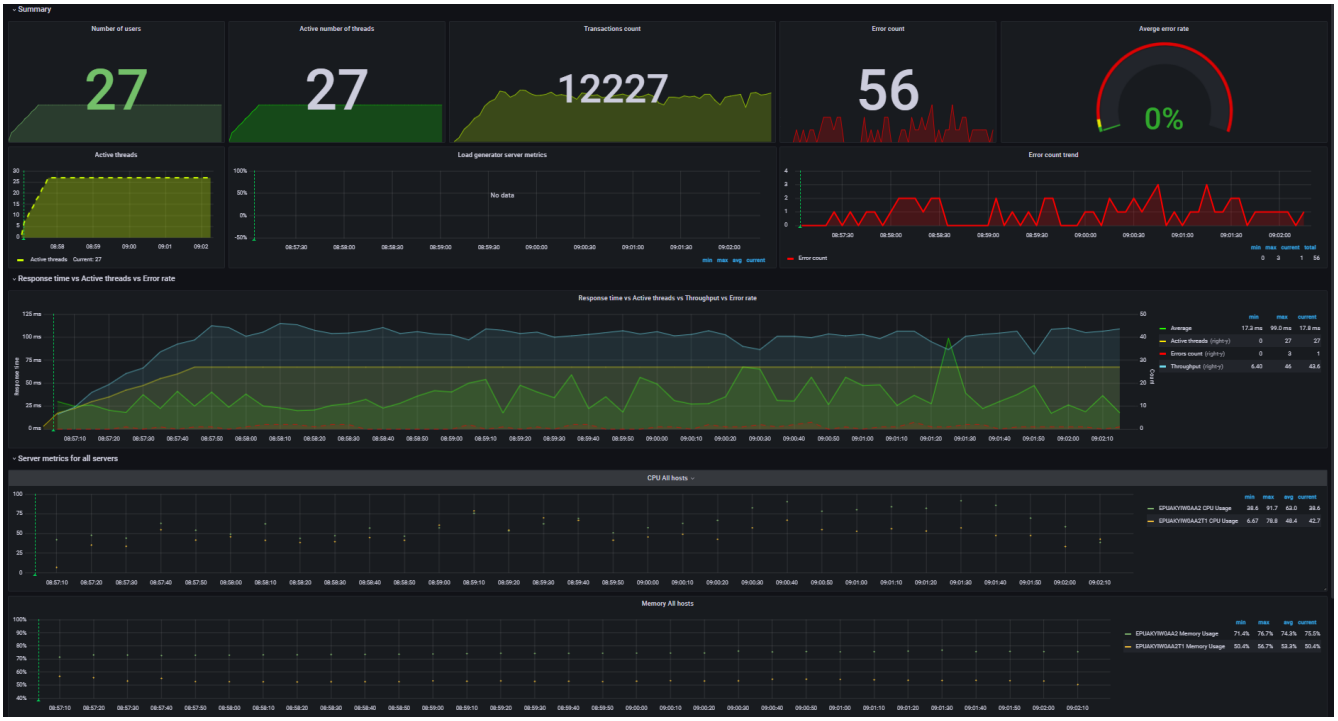
Aggregate report:

transaction	NumberOfSamples	Average	pct90	pct95	pct99	Min	Max	Error Count
TC_start_Open Home page	98.00	25.09	47.20	115.00	408.00	9.00	408.00	-
TC_Open Random page >1	359.00	28.16	98.30	161.95	488.37	6.00	491.00	-
TC_Open Random page =1	29.00	21.36	66.00	81.70	88.00	9.00	88.00	-
TC_Open Random Date	430.00	25.57	90.60	135.10	377.25	6.00	378.00	-
TC_Open Predefined Date	1.31 K	25.02	150.10	218.75	488.18	5.00	489.00	-
TC_Open Large Calendar	479.00	27.48	157.90	208.30	431.87	6.00	433.00	-
TC_Open Home page	660.00	30.23	127.50	258.35	482.29	7.00	483.00	-
TC_Open Contacts	159.00	20.68	57.00	99.85	238.00	6.00	238.00	-
TC_Ed_Open login page	2.00	114.00	158.00	158.00	158.00	70.00	158.00	-
TC_Ed_Open editpost page	80.00	21.83	89.80	210.20	229.00	3.00	229.00	-
TC_Ed_Open Random post	81.00	24.78	56.20	112.15	281.00	10.00	281.00	-
TC_Ed_Open Predefined Date	81.00	21.89	50.00	72.20	174.00	8.00	174.00	-
TC_Ed_Open Home page	2.00	26.00	38.00	38.00	38.00	14.00	38.00	-
TC_Ed_Login	2.00	21.00	23.00	23.00	23.00	19.00	23.00	-
TC_Ad_Open login page	14.00	61.93	75.00	75.00	75.00	46.00	75.00	-
TC_Ad_Open Users page	133.00	73.56	186.20	239.85	342.54	18.00	343.00	-
TC_Ad_Open USERS menu	133.00	12.60	48.10	113.50	306.60	2.00	308.00	-
TC_Ad_Open Home page	14.00	19.03	80.00	80.00	109.00	10.00	109.00	-
TC_Ad_Open Admin Page	133.00	9.59	37.00	83.80	305.00	2.00	305.00	-
TC_Ad_Login	14.00	52.58	470.90	514.00	514.00	16.00	514.00	-
TC_Ad_LogOff	12.00	41.87	283.00	283.00	283.00	13.00	283.00	-
TC_Ad_Delete user	67.00	29.14	115.80	257.20	440.00	8.00	440.00	-
TC_Ad_Add user	64.00	33.99	97.50	198.50	596.00	11.00	596.00	-
TC_Ed_Editpost	79.00	163.47	266.30	331.70	675.00	14.00	675.00	27.00
leave a comment	591.00	39.36	179.20	300.65	1.28 K	6.00	1.29 K	3.00
Open Random post	1.86 K	32.28	129.30	278.45	553.70	4.00	556.00	2.00
TC_Search by Name	1.34 K	82.85	247.20	350.30	634.77	5.00	637.00	1.00
Open first post	1.04 K	34.00	199.70	272.20	511.40	6.00	512.00	1.00

8 **Test results with 4 CPUs while maintaining the same maximum RAM value (6144 MB):**



Response time vs Active threads vs Throughput vs Error rate graph:



Aggregate report:

9 **Test results with 6 CPUs while maintaining the same maximum RAM value (6144 MB)**

Please find the results in point 4 (Test results with RAM 6GB while keeping the maximum value of CPUs (6) unchanged) they are similar.

Links to source data:

CPUs	RAM	Full report	Part of report with IIS working time
1	6Gb	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1678315331522&to=1678316240245&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter	For this configuration, IIS did not stop running
2	6Gb	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1678320946771&to=1678321865229&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1678320946771&to=1678321536094&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter
3	6Gb	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1678343582544&to=1678344018945&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1678343582544&to=1678343831329&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter
4	6Gb	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1678345025254&to=1678345923792&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1678345020904&to=1678345339562&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter
6	2Gb	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1677870478884&to=1677871545211&var-group_time=5s&var-metric=All&var-	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1677870478884&to=1677870700753&var-group_time=5s&var-metric=All&var-scenario=All&var-

		scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter	transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter
6	3Gb	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1678364239833&to=1678364664394&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1678364239833&to=1678364570711&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter
6	4Gb	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1677879113951&to=1677880019631&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter	For this configuration, IIS did not stop running
6	6Gb	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1677880597508&to=1677881031836&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter	http://localhost:3000/d/rxKcwpFmk_3/load-test-monitoring_3?orgId=1&from=1677880597508&to=1677880775718&var-group_time=5s&var-metric=All&var-scenario=All&var-transactions=All&var-server_measurements=All&var-host=All&var-measurement=jmeter