Технополис Mail.ru Group

Сравнительный отчёт по тестированию для Stage 3

Дисциплина: Проектирование высоконагруженных систем Лопатинский И.С.

Содержание

1	Get	empty	3
	1.1	stage 3	3
	1.2	stage 2	
2	Put		7
	2.1	stage 3	7
		stage 2	
3	Get		12
	3.1	stage 3	12
		stage 2	
4	Dele	${f e}$	16
	4.1	stage 3	16
		stage 2	
5	Вын	оды	21
		get empty	21
		out	
		get full	
		lelete	
		В общем	

1 Get empty

1.1 stage 3

Рассмотрим результаты нагрузочного тестирования на запросы данных при отсутсвии каких-либо данных на сервере:

```
Running 2m test @ http://localhost:8080
    4 threads and 4 connections
    Thread calibration: mean lat.: 4.212ms, rate sampling interval: 21ms
    Thread calibration: mean lat.: 4.205ms, rate sampling interval:
    Thread calibration: mean lat.: 3.951ms, rate sampling interval: 19ms
    Thread calibration: mean lat.: 4.017ms, rate sampling interval: 20ms
    Thread Stats
                              Stdev
                                         Max +/- Stdev
                   Avg
     Latency
                   6.37ms
                             38.18ms
                                        1.00s
                                                  99.42%
      Req/Sec
                   2.60k
                              0.87k
                                       13.05k
                                                  75.29%
9
   Latency Distribution (HdrHistogram - Recorded Latency)
10
   50.000%
               2.12ms
11
12
   75.000%
               5.16ms
   90.000%
              10.82ms
13
   99.000%
             24.98ms
14
   99.900%
           759.29ms
   99.990%
            986.11ms
16
   99.999%
              1.00s
17
 100.000%
               1.00s
18
19
    Detailed Percentile spectrum:
20
                                TotalCount 1/(1-Percentile)
         Value
                  Percentile
21
22
         0.053
                    0.000000
                                          1
                                                     1.00
         0.568
                    0.100000
                                      80088
                                                     1.11
24
         0.942
                    0.200000
                                     160059
                                                     1.25
25
         1.220
                                                     1.43
                    0.300000
                                     240103
         1.621
                    0.400000
                                     320173
                                                     1.67
         2.125
                    0.500000
                                     400014
                                                     2.00
28
         2.539
                    0.550000
                                     440030
                                                     2.22
29
         3.013
                    0.600000
                                     479998
                                                     2.50
         3.569
                    0.650000
                                     519962
                                                     2.86
31
         4.267
                    0.700000
                                     560141
                                                     3.33
32
         5.155
                    0.750000
                                                     4.00
                                     600033
33
         5.695
                    0.775000
                                     620083
                                                     4.44
         6.339
                    0.800000
                                     640006
                                                     5.00
35
         7.103
                    0.825000
                                     659966
                                                     5.71
36
         8.063
                    0.850000
                                     679966
                                                     6.67
37
                                                     8.00
         9.311
                    0.875000
                                     700025
        10.031
                    0.887500
                                     709982
                                                     8.89
39
        10.823
                    0.900000
                                     719946
                                                    10.00
40
        11.751
                    0.912500
                                     730007
                                                    11.43
41
                                     740013
                                                    13.33
        12.807
                    0.925000
        13.991
                    0.937500
                                     749995
                                                    16.00
43
        14.639
                    0.943750
                                     754991
                                                    17.78
44
        15.343
                    0.950000
                                     759982
                                                    20.00
        16.087
                    0.956250
                                     764955
                                                    22.86
        16.895
                    0.962500
                                     769997
                                                    26.67
47
        17.791
                    0.968750
                                     774968
                                                    32.00
48
                                     777485
        18.287
                    0.971875
                                                    35.56
49
                                     779941
        18.831
                    0.975000
                                                    40.00
        19.471
51
                    0.978125
                                     782499
                                                    45.71
        20.207
                    0.981250
                                     784977
                                                    53.33
52
        21.183
                    0.984375
                                     787446
                                                    64.00
53
        21.823
                  0.985938
                                     788703
                                                    71.11
```

55	22.671	0.987500	789940	80.00	
56	23.903	0.989062	791195	91.43	
57	25.983	0.990625	792440	106.67	
58	29.839	0.992188	793692	128.00	
59	32.575	0.992969	794318	142.22	
60	38.687	0.993750	794941	160.00	
61	52.383	0.994531	795565	182.86	
		0.995313		213.33	
62	82.495		796190		
63	211.071	0.996094	796815	256.00	
64	260.863	0.996484	797127	284.44	
65	313.343	0.996875	797440	320.00	
66	359.935	0.997266	797752	365.71	
67	433.407	0.997656	798065	426.67	
68	530.431	0.998047	798377	512.00	
69	575.999	0.998242	798533	568.89	
70	625.663	0.998437	798690	640.00	
71	669.183	0.998633	798846	731.43	
	718.847	0.998828	799003	853.33	
72					
73	765.439	0.999023	799159	1024.00	
74	790.015	0.999121	799236	1137.78	
75	815.103	0.999219	799315	1280.00	
76	838.655	0.999316	799394	1462.86	
	862.207	0.999414	799471	1706.67	
77					
78	887.295	0.999512	799549	2048.00	
79	899.583	0.999561	799588	2275.56	
80	912.383	0.999609	799627	2560.00	
81	924.671	0.999658	799666	2925.71	
82	937.471	0.999707	799705	3413.33	
83	950.271	0.999756	799745	4096.00	
84	956.415	0.999780	799764	4551.11	
85	962.559	0.999805	799783	5120.00	
86	968.703	0.999829	799803	5851.43	
87	974.847	0.999854	799822	6826.67	
88	981.503	0.999878	799843	8192.00	
89	984.575	0.999890	799854	9102.22	
				10240.00	
90	986.623	0.999902	799861		
91	988.671	0.999915	799872	11702.86	
92	990.719	0.999927	799882	13653.33	
93	992.767	0.999939	799891	16384.00	
94	994.303	0.999945	799897	18204.44	
95	995.327	0.999951	799900	20480.00	
96	996.351	0.999957	799906	23405.71	
97	997.375	0.999963	799912	27306.67	
98	997.887	0.999969	799915	32768.00	
99	998.911	0.999973	799924	36408.89	
100	998.911	0.999976	799924	40960.00	
101	998.911	0.999979	799924	46811.43	
102	999.423	0.999982	799927	54613.33	
103	999.423	0.999985	799927	65536.00	
104	999.935	0.999986	799930	72817.78	
105	999.935	0.999988	799930	81920.00	
106	1000.447	0.999989	799934	93622.86	
107	1000.447	0.999991	799934	109226.67	
	1000.447	0.999992	799934	131072.00	
108					
109	1000.447	0.999993	799934	145635.56	
110	1000.959	0.999994	799935	163840.00	
111	1000.959	0.999995	799935	187245.71	
112	1001.471	0.999995	799937	218453.33	
113	1001.471	0.999996	799937	262144.00	
114	1001.471	0.999997	799937	291271.11	
114	1001.111	0.00001	100001	2012/1/11	

```
1001.471 0.999997
                                 799937
                                           327680.00
      1001.471
                   0.999997
                                 799937
                                           374491.43
116
      1001.983
                   0.999998
                                 799939
                                           436906.67
117
      1001.983
                  1.000000
                                 799939
                                                inf
118
119 #[Mean =
                   6.370, StdDeviation
                                                  38.177]
                                          =
                                        =
120 #[Max =
                  1001.472, Total count
                                                  799939]
                 27, SubBuckets
121 #[Buckets =
    899972 requests in 1.50m, 59.22MB read
123
   Non-2xx or 3xx responses: 899972
Requests/sec: 9999.74
126 Transfer/sec: 673.81KB
```

```
2 Running 1m test @ http://localhost:8080
    4 threads and 4 connections
4
    Thread calibration: mean lat.: 4.672ms, rate sampling interval: 21ms
    Thread calibration: mean lat.: 4.046ms, rate sampling interval: 20ms
5
    Thread calibration: mean lat.: 2.280ms, rate sampling interval: 10ms
6
    Thread calibration: mean lat.: 4.643ms, rate sampling interval: 21ms
    Thread Stats Avg
                            Stdev
                                      Max +/- Stdev
8
    Latency
                   4.04\,\mathrm{ms}
                             5.51ms 95.74ms
                                                89.63%
9
     Req/Sec
                   2.62k
                           834.36 8.33k
                                                75.98%
10
   Latency Distribution (HdrHistogram - Recorded Latency)
11
            1.99ms
   50.000%
12
   75.000%
              5.03ms
13
   90.000%
              9.75ms
14
   99.000%
             25.14ms
   99.900%
           58.01ms
16
   99.990%
           88.89ms
17
   99.999%
             94.46ms
            95.81ms
19
  100.000%
20
    Detailed Percentile spectrum:
21
         Value Percentile TotalCount 1/(1-Percentile)
22
         0.054
                    0.00000
                                                   1.00
                                         1
24
         0.551
                   0.100000
                                     50098
                                                   1.11
25
         0.919
                   0.200000
                                                   1.25
                                    100112
         1.176
                   0.300000
                                    150050
                                                   1.43
27
         1.553
                   0.400000
                                    200127
                                                   1.67
2.8
                   0.500000
                                                   2.00
         1.992
                                    250035
29
         2.405
                   0.550000
                                   275047
                                                   2.22
         2.897
                   0.600000
                                   300075
                                                   2.50
31
         3.469
                   0.650000
                                   325026
                                                   2.86
32
         4.167
                   0.700000
                                   350058
                                                   3.33
33
         5.027
                   0.750000
                                   375087
                                                   4.00
                   0.775000
         5.535
                                                   4.44
35
                                   387538
         6.115
                   0.800000
                                   400032
                                                   5.00
36
         6.787
                   0.825000
                                   412486
                                                   5.71
         7.583
                   0.850000
                                    424992
                                                   6.67
         8.543
                   0.875000
                                    437542
                                                   8.00
39
         9.103
                   0.887500
                                    443774
                                                   8.89
40
                  0.900000
         9.751
                                    450016
                                                  10.00
41
42
        10.495
                   0.912500
                                    456258
                                                  11.43
                 0.925000
        11.359
                                   462494
                                              13.33
43
```

44	12.399	0.937500	468766	16.00	
45	12.975	0.943750	471858	17.78	
46	13.655	0.950000	475008	20.00	
47	14.439	0.956250	478132	22.86	
	15.319	0.962500	481252	26.67	
48					
49	16.447	0.968750	484357	32.00	
50	17.135	0.971875	485921	35.56	
51	17.919	0.975000	487493	40.00	
52	18.879	0.978125	489050	45.71	
53	20.015	0.981250	490616	53.33	
54	21.423	0.984375	492173	64.00	
55	22.255	0.985938	492953	71.11	
56	23.247	0.987500	493744	80.00	
57	24.351	0.989062	494514	91.43	
58	25.759	0.990625	495296	106.67	
59	27.631	0.992188	496077	128.00	
60	28.847	0.992969	496467	142.22	
61	30.463	0.993750	496858	160.00	
62	32.015	0.994531	497250	182.86	
	33.887	0.995313	497642	213.33	
63		0.996094	498031		
64	36.799			256.00	
65	38.623	0.996484	498225	284.44	
66	39.935	0.996875	498419	320.00	
67	40.895	0.997266	498621	365.71	
68	42.559	0.997656	498813	426.67	
69	45.695	0.998047	499008	512.00	
70	47.583	0.998242	499104	568.89	
71	50.335	0.998437	499200	640.00	
72	52.767	0.998633	499298	731.43	
73	55.935	0.998828	499396	853.33	
74	58.271	0.999023	499493	1024.00	
75	59.519	0.999121	499543	1137.78	
76	60.607	0.999219	499592	1280.00	
77	61.887	0.999316	499640	1462.86	
78	63.135	0.999414	499689	1706.67	
79	65.183	0.999512	499737	2048.00	
80	68.159	0.999561	499762	2275.56	
	72.575	0.999609	499787	2560.00	
81					
82	75.391	0.999658	499811	2925.71	
83	77.055	0.999707	499835	3413.33	
84	81.791	0.999756	499859	4096.00	
85	84.735	0.999780	499872	4551.11	
86	85.823	0.999805	499885	5120.00	
87	86.847	0.999829	499896	5851.43	
88	87.551	0.999854	499909	6826.67	
89	88.255	0.999878	499920	8192.00	
90	88.639	0.999890	499928	9102.22	
91	88.959	0.999902	499933	10240.00	
92	89.279	0.999915	499939	11702.86	
93	89.599	0.999927	499945	13653.33	
94	89.919	0.999939	499951	16384.00	
95	90.303	0.999945	499955	18204.44	
96	90.495	0.999951	499957	20480.00	
97	90.751	0.999957	499960	23405.71	
98	91.071	0.999963	499963	27306.67	
99	91.967	0.999969	499966	32768.00	
	92.607	0.999973	499968	36408.89	
100	92.927	0.999976	499969	40960.00	
101	93.311	0.999976	499971	46811.43	
102				54613.33	
103	93.631	0.999982	499973	04013.33	

```
93.887
                   0.999985
                                  499974
                                             65536.00
        94.207
                   0.999986
                                  499975
                                             72817.78
        94.207
                                             81920.00
                   0.999988
                                  499975
106
        94.463
                   0.999989
                                  499976
                                             93622.86
        94.719
                   0.999991
                                  499977
                                            109226.67
        95.039
                   0.999992
                                  499978
                                            131072.00
109
        95.039
                   0.999993
                                  499978
                                            145635.56
        95.039
                   0.999994
                                  499978
                                           163840.00
111
        95.359
                   0.999995
                                  499979
                                            187245.71
112
        95.359
                   0.999995
                                  499979
                                            218453.33
        95.615
                   0.999996
                                  499980
                                            262144.00
114
        95.615
                   0.999997
                                  499980
                                            291271.11
115
        95.615
                   0.999997
                                  499980
                                            327680.00
        95.615
                   0.999997
                                  499980
                                           374491.43
117
        95.615
                   0.999998
                                  499980
                                            436906.67
118
                                           524288.00
        95.807
                   0.999998
                                  499981
119
        95.807
                   1.000000
                                                  inf
                                  499981
121 #[Mean
           =
                    4.043, StdDeviation
                                                    5.508]
122 # [ Max
                    95.744, Total count
                                                   499981]
123 #[Buckets =
                       27, SubBuckets
                                                     2048]
124
    599971 requests in 1.00m, 40.16MB read
125
    Non-2xx or 3xx responses: 399984
                  9998.64
127 Requests/sec:
                 685.38KB
128 Transfer/sec:
```

2 Put

2.1 stage 3

Рассмотрим результаты нагрузочного тестирования на запись данных:

```
Running 2m test @ http://localhost:8080
    4 threads and 4 connections
    Thread calibration: mean lat.: 4.240ms, rate sampling interval: 22ms
    Thread calibration: mean lat.: 4.265ms, rate sampling interval: 23ms
    Thread calibration: mean lat.: 4.011ms, rate sampling interval: 21ms
5
    Thread calibration: mean lat.: 4.421ms, rate sampling interval: 23ms
6
    Thread Stats Avg
                                             +/- Stdev
                            Stdev
                                      Max
7
     Latency
                 15.63ms
                            86.28ms
                                     1.01s
                                               97.99%
      Req/Sec
                  2.62k
                             0.91k
                                    12.14k
                                                75.50%
9
   Latency Distribution (HdrHistogram - Recorded Latency)
   50.000%
             2.38ms
11
   75.000%
              5.88ms
   90.000%
             13.07ms
13
   99.000%
           565.76ms
14
           961.02ms
   99.900%
   99.990%
             1.00s
   99.999%
             1.01s
17
  100.000%
             1.01s
18
19
    Detailed Percentile spectrum:
20
                 Percentile TotalCount 1/(1-Percentile)
         Value
21
22
         0.058
                   0.000000
                                                   1.00
                                        1
         0.594
                   0.100000
                                    80172
                                                   1.11
24
         0.973
                   0.200000
                                   160383
                                                   1.25
25
         1.296
                   0.300000
                                   240130
                                                   1.43
26
         1.726
                 0.400000
                                   320246
                                                   1.67
```

28	2.379	0.500000	400263	2.00	
29	2.835	0.550000	440330	2.22	
30	3.351	0.600000	480289	2.50	
	3.991	0.650000	520280	2.86	
31					
32	4.815	0.700000	560349	3.33	
33	5.875	0.750000	600319	4.00	
34	6.555	0.775000	620373	4.44	
35	7.367	0.800000	640332	5.00	
36	8.399	0.825000	660313	5.71	
37	9.695	0.850000	680329	6.67	
38	11.247	0.875000	700328	8.00	
39	12.127	0.887500	710373	8.89	
	13.071	0.900000	720362	10.00	
40					
41	14.095	0.912500	730342	11.43	
42	15.247	0.925000	740375	13.33	
43	16.591	0.937500	750368	16.00	
44	17.359	0.943750	755419	17.78	
45	18.239	0.950000	760410	20.00	
46	19.327	0.956250	765362	22.86	
47	20.783	0.962500	770381	26.67	
	23.679	0.968750	775357	32.00	
48	26.735	0.900730			
49			777856	35.56	
50	32.111	0.975000	780351	40.00	
51	45.663	0.978125	782854	45.71	
52	166.015	0.981250	785360	53.33	
53	307.455	0.984375	787860	64.00	
54	380.927	0.985938	789105	71.11	
55	450.303	0.987500	790359	80.00	
56	523.519	0.989062	791608	91.43	
57	594.943	0.990625	792858	106.67	
58	657.919	0.992188	794115	128.00	
59	692.735	0.992969	794734	142.22	
60	728.063	0.993750	795358	160.00	
	759.807	0.994531	796000	182.86	
61	796.159	0.995313		213.33	
62			796610		
63	833.535	0.996094	797238	256.00	
64	850.943	0.996484	797550	284.44	
65	868.351	0.996875	797861	320.00	
66	888.319	0.997266	798176	365.71	
67	903.679	0.997656	798493	426.67	
68	922.111	0.998047	798797	512.00	
69	930.815	0.998242	798959	568.89	
70	938.495	0.998437	799123	640.00	
71	945.151	0.998633	799274	731.43	
72	952.831	0.998828	799431	853.33	
73	962.047	0.999023	799579	1024.00	
74	967.167	0.999121	799659	1137.78	
	972.287	0.999219	799740	1280.00	
75	976.895	0.999316	799815	1462.86	
76					
77	981.503	0.999414	799900	1706.67	
78	985.087	0.999512	799972	2048.00	
79	987.647	0.999561	800016	2275.56	
80	989.695	0.999609	800053	2560.00	
81	991.743	0.999658	800094	2925.71	
82	994.303	0.999707	800129	3413.33	
83	996.863	0.999756	800177	4096.00	
84	997.375	0.999780	800193	4551.11	
85	997.887	0.999805	800206	5120.00	
86	998.911	0.999829	800232	5851.43	
87	999.423	0.999854	800243	6826.67	
01	555.125	0.00004	500210	0020.01	

```
1000.959
                     0.999878
                                      800275
                                                   8192.00
       1000.959
                     0.999890
                                      800275
                                                   9102.22
       1001.471
                                                  10240.00
                     0.999902
                                      800284
90
       1002.495
                     0.999915
                                      800299
                                                  11702.86
91
       1003.007
                     0.999927
                                      800306
                                                  13653.33
       1003.519
                     0.999939
                                      800313
                                                  16384.00
       1004.031
                     0.999945
                                      800318
                                                  18204.44
94
       1004.543
                     0.999951
                                      800322
                                                  20480.00
95
       1005.055
                     0.999957
                                                  23405.71
                                      800327
96
       1006.079
                     0.999963
                                      800333
                                                  27306.67
       1006.591
                     0.999969
                                      800337
                                                  32768.00
98
       1007.103
                     0.999973
                                      800340
                                                  36408.89
99
       1007.615
                     0.999976
                                      800343
                                                  40960.00
       1007.615
                     0.999979
                                      800343
                                                  46811.43
101
       1008.127
                     0.999982
                                      800348
                                                  54613.33
       1008.127
                     0.999985
                                      800348
                                                  65536.00
103
       1008.639
                     0.999986
                                                  72817.78
                                      800352
105
       1008.639
                     0.999988
                                      800352
                                                  81920.00
       1008.639
                     0.999989
                                      800352
                                                  93622.86
106
       1009.151
                     0.999991
                                      800355
                                                 109226.67
       1009.151
                     0.999992
                                      800355
                                                 131072.00
       1009.151
                     0.999993
                                      800355
                                                 145635.56
109
       1009.663
                     0.999994
                                      800358
                                                 163840.00
       1009.663
                     0.999995
                                      800358
                                                 187245.71
                                                 218453.33
112
       1009.663
                     0.999995
                                      800358
113
       1009.663
                     0.999996
                                      800358
                                                 262144.00
       1009.663
                     0.999997
                                      800358
                                                 291271.11
114
       1009.663
                     0.999997
                                      800358
                                                 327680.00
115
       1009.663
                     0.999997
                                      800358
                                                 374491.43
116
       1010.175
                     0.999998
                                      800359
                                                 436906.67
117
       1010.175
                     0.999998
                                      800359
                                                 524288.00
118
                                                 582542.22
       1010.175
                     0.999998
                                      800359
119
120
       1010.175
                     0.999998
                                      800359
                                                 655360.00
       1010.175
                     0.999999
                                      800359
                                                 748982.86
121
       1010.687
                     0.999999
                                                 873813.33
                                      800360
       1010.687
                     1.000000
                                      800360
124 #[Mean
           =
                     15.630, StdDeviation
                                                         86.281]
           =
                    1010.176, Total count
125 #[Max
                                                         800360]
126 #[Buckets =
                           27, SubBuckets
                                                           2048]
     899946 requests in 1.50m, 57.50MB read
129 Requests/sec:
                    9999.45
130 Transfer/sec:
                   654.26KB
```

```
Running 1m test @ http://localhost:8080
    4 threads and 4 connections
    Thread calibration: mean lat.: 2.661ms, rate sampling interval: 12ms
    Thread calibration: mean lat.: 2.453ms, rate sampling interval: 11ms
4
   Thread calibration: mean lat.: 11.778ms, rate sampling interval: 71ms
5
   Thread calibration: mean lat.: 8.227ms, rate sampling interval: 44ms
6
                            Stdev
   Thread Stats Avg
                                             +/- Stdev
                                       Max
                  8.28ms
                            57.84ms
                                      1.00s
                                               99.06%
8
     Latency
      Req/Sec
                  2.65k
                             0.88k
                                    13.33k
                                               79.72%
9
   Latency Distribution (HdrHistogram - Recorded Latency)
10
11
   50.000%
              1.78ms
   75.000%
              4.13ms
```

```
90.000%
              8.06ms
   99.000%
               39.87ms
14
   99.900%
              903.68ms
15
   99.990%
              992.26ms
16
   99.999%
                1.00s
17
18 100.000%
                1.00s
19
    Detailed Percentile spectrum:
20
                                   TotalCount 1/(1-Percentile)
          Value
                    Percentile
21
22
          0.044
                      0.00000
                                              1
                                                         1.00
23
          0.500
                      0.100000
                                         50056
                                                         1.11
24
          0.859
                      0.200000
                                        100041
                                                         1.25
25
          1.092
                      0.300000
                                        149996
                                                         1.43
26
          1.412
                      0.400000
                                        200049
                                                         1.67
27
          1.781
                      0.500000
                                        250082
                                                         2.00
28
                                                         2.22
          2.038
                                        274967
29
                      0.550000
          2.435
                      0.600000
                                        299969
                                                         2.50
30
          2.897
                      0.650000
                                        324933
                                                         2.86
31
                      0.700000
          3.439
                                        349961
                                                         3.33
32
          4.127
                      0.750000
                                        374952
                                                         4.00
          4.547
                      0.775000
                                        387436
                                                         4.44
34
          5.027
                      0.800000
                                        399960
                                                         5.00
35
          5.575
                      0.825000
                                        412407
                                                         5.71
36
37
          6.227
                      0.850000
                                        424917
                                                         6.67
          7.031
                      0.875000
                                        437395
                                                         8.00
38
          7.515
                      0.887500
                                        443665
                                                         8.89
39
                                                        10.00
          8.059
                      0.900000
                                        449903
40
          8.711
                      0.912500
                                        456141
                                                        11.43
41
          9.543
                                        462398
                      0.925000
                                                        13.33
42
         10.623
                      0.937500
                                        468660
                                                        16.00
43
         11.287
                      0.943750
                                        471780
                                                        17.78
44
45
         12.055
                      0.950000
                                        474899
                                                        20.00
         12.967
                      0.956250
                                        478027
                                                        22.86
46
         14.047
                      0.962500
                                        481140
                                                        26.67
47
         15.431
                      0.968750
                                        484255
                                                        32.00
         16.303
                      0.971875
                                        485829
                                                        35.56
49
         17.391
                      0.975000
                                        487399
                                                        40.00
50
         18.799
                      0.978125
                                        488958
                                                        45.71
51
         20.735
                      0.981250
                                        490513
                                                        53.33
         23.343
                      0.984375
                                        492071
                                                        64.00
53
         25.247
                      0.985938
                                        492849
                                                        71.11
54
         28.047
                      0.987500
                                        493631
                                                        80.00
         33.855
                      0.989062
                                        494412
                                                        91.43
56
         67.519
                      0.990625
                                        495190
                                                       106.67
57
        223.487
                      0.992188
                                        495971
                                                       128.00
58
                                        496363
        299.263
                      0.992969
                                                       142.22
59
        382.719
                      0.993750
                                        496754
                                                       160.00
        461.823
                      0.994531
                                        497143
                                                       182.86
61
        544.767
                      0.995313
                                        497537
                                                       213.33
62
        612.863
                                                       256.00
                      0.996094
                                        497925
63
        653.311
                      0.996484
                                        498121
                                                       284.44
                                                       320.00
        699.903
                      0.996875
                                        498315
65
                      0.997266
        729.599
                                        498511
                                                       365.71
66
        768.511
                      0.997656
                                        498705
                                                       426.67
67
        807.935
                      0.998047
                                        498902
                                                       512.00
68
        830.463
                      0.998242
                                        498999
                                                       568.89
69
        847.871
                      0.998437
                                        499096
                                                       640.00
70
        876.031
                                                       731.43
71
                      0.998633
                                        499194
72
        891.391
                      0.998828
                                        499293
                                                       853.33
```

```
907.775
                    0.999023
                                                 1024.00
                                    499389
        916.991
                    0.999121
                                    499438
                                                 1137.78
74
        926.207
                    0.999219
                                    499489
                                                 1280.00
75
        934.399
                                                 1462.86
                    0.999316
                                    499537
76
        945.663
                    0.999414
                                    499584
                                                 1706.67
77
        953.343
                    0.999512
                                    499633
                                                 2048.00
78
79
        958.975
                    0.999561
                                    499657
                                                 2275.56
        963.583
                    0.999609
                                    499681
                                                 2560.00
80
                    0.999658
        970.751
                                    499708
                                                 2925.71
81
        974.335
                    0.999707
                                    499730
                                                 3413.33
82
        977.919
                    0.999756
                                    499754
                                                 4096.00
83
                                                 4551.11
        980.479
                    0.999780
                                    499768
84
        983.039
                    0.999805
                                    499780
                                                 5120.00
85
        985.087
                    0.999829
                                    499791
                                                 5851.43
86
        987.647
                    0.999854
                                    499803
                                                 6826.67
87
        990.207
                    0.999878
                                    499816
                                                 8192.00
88
        991.743
                                    499824
                                                 9102.22
89
                    0.999890
        992.767
                    0.999902
                                    499829
                                                10240.00
90
        993.791
                    0.999915
                                    499835
                                                11702.86
91
        995.839
                    0.999927
                                    499841
                                                13653.33
92
        997.375
                    0.999939
                                    499847
                                                16384.00
        997.887
                    0.999945
                                    499851
                                                18204.44
94
        998.399
                    0.999951
                                    499854
                                                20480.00
95
                    0.999957
       998.911
                                    499857
                                                23405.71
96
97
        999.423
                    0.999963
                                    499859
                                                27306.67
       999.935
                    0.999969
                                    499862
                                                32768.00
98
      1000.447
                    0.999973
                                    499865
                                                36408.89
99
      1000.447
                    0.999976
                                    499865
                                                40960.00
100
      1000.959
                    0.999979
                                    499868
                                                46811.43
      1000.959
                    0.999982
                                    499868
                                                54613.33
102
      1001.471
                    0.999985
                                    499873
                                                65536.00
                                                72817.78
      1001.471
                    0.999986
                                    499873
104
105
      1001.471
                    0.999988
                                    499873
                                                81920.00
      1001.471
                    0.999989
                                    499873
                                                93622.86
106
      1001.471
                    0.999991
                                    499873
                                               109226.67
107
      1001.471
                    0.999992
                                    499873
                                               131072.00
108
      1001.471
                    0.999993
                                    499873
                                              145635.56
109
      1001.471
                    0.999994
                                    499873
                                               163840.00
110
                    0.999995
      1001.983
                                    499875
                                               187245.71
111
      1001.983
                    0.999995
                                               218453.33
                                    499875
112
      1001.983
                    0.999996
                                    499875
                                               262144.00
113
      1001.983
                    0.999997
                                    499875
                                               291271.11
114
      1001.983
                    0.999997
                                               327680.00
115
                                    499875
      1001.983
                    0.999997
                                    499875
                                               374491.43
116
      1001.983
                    0.999998
                                    499875
                                               436906.67
117
      1002.495
                    0.999998
                                    499876
                                               524288.00
118
      1002.495
                    1.000000
                                    499876
                                                    inf
119
120 #[Mean
          =
                     8.280, StdDeviation
                                                      57.841]
                   1001.984, Total count
121 #[Max
                                                      499876]
                 27, SubBuckets
122 #[Buckets =
                                                        2048]
123
599917 requests in 1.00m, 38.33MB read
Requests/sec: 9999.02
126 Transfer/sec: 654.23KB
```

3 Get

3.1 stage 3

Рассмотрим результаты нагрузочного тестирования на запрос ранее записанных данных:

```
Running 2m test @ http://localhost:8080
    4 threads and 4 connections
    Thread calibration: mean lat.: 7.918ms, rate sampling interval: 34ms
    Thread calibration: mean lat.: 6.620ms, rate sampling interval: 30ms
    Thread calibration: mean lat.: 6.457ms, rate sampling interval: 28ms
    Thread calibration: mean lat.: 6.742ms, rate sampling interval: 31ms
    Thread Stats
                              Stdev
                                         Max +/- Stdev
                   Avg
     Latency
                   6.62ms
                             41.86ms
                                        1.01s
                                                  99.49%
      Req/Sec
                   2.57k
                            604.97
                                      8.63k
                                                  75.24%
9
    Latency Distribution (HdrHistogram - Recorded Latency)
10
   50.000%
               2.41ms
11
12
   75.000%
               5.10ms
   90.000%
              10.28ms
13
   99.000%
             20.72ms
14
   99.900%
            801.79ms
   99.990%
             993.28ms
16
   99.999%
              1.01s
17
18 100.000%
               1.01s
19
    Detailed Percentile spectrum:
20
                                TotalCount 1/(1-Percentile)
          Value
                  Percentile
21
22
          0.070
                     0.000000
                                           1
                                                     1.00
          0.629
                     0.100000
                                      80065
                                                     1.11
24
         1.014
                     0.200000
                                     160220
                                                     1.25
25
          1.364
                     0.300000
                                     240102
                                                     1.43
27
          1.790
                    0.400000
                                     320058
                                                     1.67
          2.413
                     0.500000
                                     399999
                                                     2.00
28
          2.803
                    0.550000
                                     440088
                                                     2.22
29
         3.229
                    0.600000
                                     480035
                                                     2.50
30
         3.729
                    0.650000
                                     519998
                                                     2.86
31
          4.343
                    0.700000
                                     560156
                                                     3.33
32
          5.103
                    0.750000
                                                     4.00
                                     599997
33
          5.563
                    0.775000
                                                     4.44
                                     620024
          6.111
                    0.800000
                                     639950
                                                     5.00
35
          6.775
                    0.825000
                                     659926
                                                     5.71
36
         7.615
                    0.850000
                                     679892
                                                     6.67
37
                    0.875000
         8.783
                                     699965
                                                     8.00
         9.487
                    0.887500
                                     709947
                                                     8.89
39
         10.279
                    0.900000
                                     719888
                                                    10.00
40
         11.151
                     0.912500
                                     729940
                                                    11.43
41
                                     739905
         12.095
                     0.925000
                                                    13.33
         13.119
                     0.937500
                                     749906
                                                    16.00
43
         13.671
                    0.943750
                                     754880
                                                    17.78
44
         14.255
                    0.950000
                                     759891
                                                    20.00
         14.887
                    0.956250
                                     764884
                                                    22.86
                    0.962500
         15.575
                                     769903
                                                    26.67
47
        16.327
                    0.968750
                                     774865
                                                    32.00
48
         16.751
                    0.971875
                                     777396
                                                    35.56
49
                                     779912
         17.215
                    0.975000
                                                    40.00
51
         17.727
                    0.978125
                                     782355
                                                    45.71
         18.319
                     0.981250
                                     784905
                                                    53.33
52
         18.991
                                     787388
                                                    64.00
53
                     0.984375
        19.359
                 0.985938
                                     788609
                                                    71.11
```

55	19.823	0.987500	789867	80.00	
56	20.351	0.989062	791132	91.43	
57	21.023	0.990625	792379	106.67	
58	21.983	0.992188	793603	128.00	
59	22.863	0.992969	794235	142.22	
60	25.151	0.993750	794854	160.00	
	31.359	0.994531	795477	182.86	
61	143.487	0.995313	796102	213.33	
62					
63	275.455	0.996094	796727	256.00	
64	346.367	0.996484	797041	284.44	
65	413.951	0.996875	797352	320.00	
66	477.183	0.997266	797664	365.71	
67	556.031	0.997656	797978	426.67	
68	626.175	0.998047	798290	512.00	
69	662.527	0.998242	798449	568.89	
70	695.807	0.998437	798605	640.00	
71	721.919	0.998633	798758	731.43	
72	764.415	0.998828	798914	853.33	
73	806.911	0.999023	799071	1024.00	
74	826.879	0.999121	799149	1137.78	
75	849.407	0.999219	799228	1280.00	
76	869.375	0.999316	799305	1462.86	
77	888.831	0.999414	799384	1706.67	
78	909.823	0.999512	799461	2048.00	
79	919.551	0.999561	799500	2275.56	
80	929.791	0.999609	799540	2560.00	
	937.471	0.999658	799578	2925.71	
81	949.247	0.999707	799618	3413.33	
82	960.511	0.999756	799656	4096.00	
83					
84	966.655	0.999780	799676	4551.11	
85	972.287	0.999805	799695	5120.00	
86	978.431	0.999829	799716	5851.43	
87	983.551	0.999854	799734	6826.67	
88	988.671	0.999878	799755	8192.00	
89	991.743	0.999890	799765	9102.22	
90	993.791	0.999902	799776	10240.00	
91	995.327	0.999915	799784	11702.86	
92	997.887	0.999927	799793	13653.33	
93	1000.959	0.999939	799804	16384.00	
94	1001.983	0.999945	799810	18204.44	
95	1002.495	0.999951	799814	20480.00	
96	1003.519	0.999957	799818	23405.71	
97	1005.055	0.999963	799823	27306.67	
98	1006.591	0.999969	799828	32768.00	
99	1007.103	0.999973	799830	36408.89	
100	1008.127	0.999976	799833	40960.00	
101	1008.639	0.999979	799835	46811.43	
102	1009.151	0.999982	799837	54613.33	
103	1010.175	0.999985	799840	65536.00	
104	1010.687	0.999986	799842	72817.78	
105	1010.687	0.999988	799842	81920.00	
	1011.199				
106		0.999989	799844	93622.86	
107	1011.199	0.999991	799844	109226.67	
108	1011.711	0.999992	799845	131072.00	
109	1012.223	0.999993	799847	145635.56	
110	1012.223	0.999994	799847	163840.00	
111	1012.223	0.999995	799847	187245.71	
112	1012.735	0.999995	799850	218453.33	
113	1012.735	0.999996	799850	262144.00	
114	1012.735	0.999997	799850	291271.11	

```
1012.735 0.999997
                                 799850
                                          327680.00
      1012.735
                  0.999997
                                 799850
                                          374491.43
116
      1012.735
                                 799850
                                          436906.67
                  0.999998
117
              0.999998
0.999998
0.999999
0.999999
      1012.735
                                 799850
                                          524288.00
118
     1012.735
                                 799850
                                         582542.22
     1012.735
                                799850
                                         655360.00
                                         748982.86
121
     1012.735
                                799850
     1013.247
                                799851
                                         873813.33
122
    1013.247
                 1.000000
                                799851
                                               inf
#[Mean = 125 #[Max =
                  6.617, StdDeviation
                                                41.858]
                1012.736, Total count
27, SubBuckets
                                                 799851]
126 #[Buckets =
127
899861 requests in 1.50m, 63.04MB read
129 Requests/sec: 9998.42
Transfer/sec: 717.29KB
```

```
Running 1m test @ http://localhost:8080
    4 threads and 4 connections
   Thread calibration: mean lat.: 3.438ms, rate sampling interval: 16ms
   Thread calibration: mean lat.: 5.724ms, rate sampling interval: 27ms
4
   Thread calibration: mean lat.: 3.747ms, rate sampling interval: 17ms
   Thread calibration: mean lat.: 6.750ms, rate sampling interval: 32ms
6
   Thread Stats Avg Stdev Max +/- Stdev
                          5.20ms 59.33ms
    Latency
                  3.97ms
                                              89.67%
8
                 2.58k 628.37 7.18k
     Req/Sec
                                              76.17%
9
   Latency Distribution (HdrHistogram - Recorded Latency)
10
   50.000%
            1.97ms
   75.000%
             4.93ms
12
   90.000%
             9.35ms
13
   99.000%
             26.19ms
14
   99.900%
            47.42ms
            56.77ms
   99.990%
16
   99.999%
             58.69ms
17
18 100.000%
           59.36ms
    Detailed Percentile spectrum:
20
         Value
               Percentile TotalCount 1/(1-Percentile)
21
22
         0.073
                   0.000000
                                                 1.00
23
                                  50008
         0.564
                   0.100000
                                                 1.11
24
                   0.200000
         0.932
                                  100055
                                                 1.25
25
                                                 1.43
        1.182
                   0.300000
                                  150176
        1.547
                  0.400000
                                  200037
                                                 1.67
        1.967
                  0.500000
                                  250035
                                                 2.00
28
        2.363
                  0.550000
                                  275042
                                                 2.22
29
        2.855
                  0.600000
                                  300071
                                                 2.50
         3.423
                   0.650000
                                  325104
                                                 2.86
31
        4.103
                  0.700000
                                  350105
                                                 3.33
32
         4.931
                                                 4.00
                  0.750000
                                  375133
33
        5.411
                  0.775000
                                  387573
                                                 4.44
         5.947
                  0.800000
                                  400045
                                                 5.00
35
         6.563
                 0.825000
                                  412601
                                                 5.71
36
                 0.850000
         7.295
                                  425056
                                                 6.67
37
                 0.875000
         8.179
                                  437548
                                                 8.00
                0.887500
                              443845
         8.727
                                                 8.89
```

40	9.351	0.900000	450066	10.00	
41	10.095	0.912500	456303	11.43	
42	10.999	0.925000	462595	13.33	
43	12.095	0.937500	468808	16.00	
44	12.759	0.943750	471954	17.78	
	13.511	0.950000	475056	20.00	
45					
46	14.431	0.956250	478185	22.86	
47	15.495	0.962500	481296	26.67	
48	16.927	0.968750	484421	32.00	
49	17.807	0.971875	486000	35.56	
50	18.719	0.975000	487570	40.00	
51	19.759	0.978125	489113	45.71	
52	21.039	0.981250	490680	53.33	
53	22.639	0.984375	492243	64.00	
54	23.567	0.985938	493025	71.11	
55	24.495	0.987500	493800	80.00	
56	25.503	0.989062	494586	91.43	
57	26.703	0.990625	495359	106.67	
58	28.223	0.992188	496144	128.00	
	29.183	0.992969	496531	142.22	
59					
60	30.063	0.993750	496926	160.00	
61	31.071	0.994531	497313	182.86	
62	32.287	0.995313	497705	213.33	
63	33.695	0.996094	498101	256.00	
64	34.495	0.996484	498290	284.44	
65	35.551	0.996875	498484	320.00	
66	37.055	0.997266	498681	365.71	
67	38.655	0.997656	498876	426.67	
68	41.311	0.998047	499073	512.00	
69	42.271	0.998242	499169	568.89	
70	43.743	0.998437	499265	640.00	
71	45.055	0.998633	499364	731.43	
72	46.303	0.998828	499461	853.33	
73	47.583	0.999023	499559	1024.00	
74	48.415	0.999121	499607	1137.78	
	49.119	0.999219	499658	1280.00	
75	49.119	0.999316	499706	1462.86	
76					
77	50.431	0.999414	499754	1706.67	
78	51.295	0.999512	499802	2048.00	
79	51.839	0.999561	499829	2275.56	
80	52.575	0.999609	499852	2560.00	
81	53.311	0.999658	499876	2925.71	
82	54.303	0.999707	499901	3413.33	
83	54.943	0.999756	499924	4096.00	
84	55.263	0.999780	499938	4551.11	
85	55.487	0.999805	499950	5120.00	
86	55.807	0.999829	499962	5851.43	
87	56.223	0.999854	499973	6826.67	
88	56.479	0.999878	499985	8192.00	
89	56.671	0.999890	499992	9102.22	
90	56.799	0.999902	500000	10240.00	
91	56.863	0.999915	500006	11702.86	
	56.895	0.999913	500012	13653.33	
92					
93	57.055	0.999939	500016	16384.00	
94	57.119	0.999945	500021	18204.44	
95	57.151	0.999951	500022	20480.00	
96	57.183	0.999957	500025	23405.71	
97	57.375	0.999963	500029	27306.67	
98	57.471	0.999969	500031	32768.00	
99	57.791	0.999973	500033	36408.89	

```
58.047
                   0.999976
                                  500034
                                             40960.00
        58.303
                   0.999979
                                  500036
                                             46811.43
        58.367
                                             54613.33
                   0.999982
                                  500037
        58.495
                   0.999985
                                  500039
                                             65536.00
103
        58.559
                   0.999986
                                  500040
                                             72817.78
        58.559
                   0.999988
                                  500040
                                            81920.00
        58.687
                  0.999989
                                  500042
                                            93622.86
106
        58.687
                  0.999991
                                  500042
                                           109226.67
107
                  0.999992
                                           131072.00
        58.783
                                  500043
108
                                           145635.56
        58.783
                  0.999993
                                  500043
        58.783
                   0.999994
                                  500043
                                            163840.00
110
                                           187245.71
        59.007
                   0.999995
                                  500044
111
        59.007
                   0.999995
                                  500044
                                           218453.33
112
        59.199
                  0.999996
                                  500045
                                           262144.00
113
        59.199
                  0.999997
                                  500045
                                           291271.11
114
                  0.999997
        59.199
                                  500045
                                           327680.00
115
        59.199
                   0.999997
                                  500045
                                            374491.43
116
117
        59.199
                   0.999998
                                  500045
                                            436906.67
        59.359
                   0.999998
                                  500046
                                           524288.00
118
        59.359
                   1.000000
                                  500046
                                                inf
119
120 #[Mean =
                    3.968, StdDeviation
                                                   5.201]
121 #[Max
            =
                   59.328, Total count
                                                   500046]
122 #[Buckets =
                 27, SubBuckets
                                                     2048]
123
    599952 requests in 1.00m, 41.88MB read
    Non-2xx or 3xx responses: 5
126 Requests/sec: 9998.66
```

4 Delete

4.1 stage 3

Рассмотрим результаты нагрузочного тестирования на удаление ранее записанных данных:

```
Running 2m test @ http://localhost:8080
    4 threads and 4 connections
    Thread calibration: mean lat.: 7.918ms, rate sampling interval: 34ms
   Thread calibration: mean lat.: 6.620ms, rate sampling interval: 30ms
4
   Thread calibration: mean lat.: 6.457ms, rate sampling interval:
    Thread calibration: mean lat.: 6.742ms, rate sampling interval: 31ms
6
                                      Max
                                             +/- Stdev
7
   Thread Stats
                   Avg
                            Stdev
                                      1.01s
                  6.62ms
                            41.86ms
                                               99.49%
8
     Latency
                  2.57k
                           604.97 8.63k
                                               75.24%
   Latency Distribution (HdrHistogram - Recorded Latency)
10
   50.000%
              2.41ms
11
   75.000%
              5.10ms
12
   90.000%
            10.28ms
13
   99.000%
             20.72ms
14
   99.900%
           801.79ms
15
   99.990%
           993.28ms
   99.999%
             1.01s
             1.01s
18 100.000%
19
    Detailed Percentile spectrum:
20
         Value
                Percentile
                             TotalCount 1/(1-Percentile)
21
22
         0.070
                   0.00000
                                                  1.00
                                        1
23
                                    80065
                                                   1.11
         0.629
                   0.100000
```

25	1.014	0.200000	160220	1.25	
26	1.364	0.300000	240102	1.43	
27	1.790	0.400000	320058	1.67	
28	2.413	0.500000	399999	2.00	
	2.803	0.550000	440088	2.22	
29					
30	3.229	0.600000	480035	2.50	
31	3.729	0.650000	519998	2.86	
32	4.343	0.700000	560156	3.33	
33	5.103	0.750000	599997	4.00	
34	5.563	0.775000	620024	4.44	
35	6.111	0.800000	639950	5.00	
36	6.775	0.825000	659926	5.71	
	7.615	0.850000	679892	6.67	
37					
38	8.783	0.875000	699965	8.00	
39	9.487	0.887500	709947	8.89	
40	10.279	0.900000	719888	10.00	
41	11.151	0.912500	729940	11.43	
42	12.095	0.925000	739905	13.33	
43	13.119	0.937500	749906	16.00	
44	13.671	0.943750	754880	17.78	
45	14.255	0.950000	759891	20.00	
	14.887	0.956250	764884	22.86	
46					
47	15.575	0.962500	769903	26.67	
48	16.327	0.968750	774865	32.00	
49	16.751	0.971875	777396	35.56	
50	17.215	0.975000	779912	40.00	
51	17.727	0.978125	782355	45.71	
52	18.319	0.981250	784905	53.33	
53	18.991	0.984375	787388	64.00	
54	19.359	0.985938	788609	71.11	
55	19.823	0.987500	789867	80.00	
56	20.351	0.989062	791132	91.43	
57	21.023	0.990625	792379	106.67	
	21.983	0.992188	793603	128.00	
58	22.863	0.992969		142.22	
59			794235		
60	25.151	0.993750	794854	160.00	
61	31.359	0.994531	795477	182.86	
62	143.487	0.995313	796102	213.33	
63	275.455	0.996094	796727	256.00	
64	346.367	0.996484	797041	284.44	
65	413.951	0.996875	797352	320.00	
66	477.183	0.997266	797664	365.71	
67	556.031	0.997656	797978	426.67	
68	626.175	0.998047	798290	512.00	
69	662.527	0.998242	798449	568.89	
70	695.807	0.998437	798605	640.00	
	721.919	0.998633	798758	731.43	
71	764.415	0.998828	798914	853.33	
72					
73	806.911	0.999023	799071	1024.00	
74	826.879	0.999121	799149	1137.78	
75	849.407	0.999219	799228	1280.00	
76	869.375	0.999316	799305	1462.86	
77	888.831	0.999414	799384	1706.67	
78	909.823	0.999512	799461	2048.00	
79	919.551	0.999561	799500	2275.56	
80	929.791	0.999609	799540	2560.00	
81	937.471	0.999658	799578	2925.71	
82	949.247	0.999707	799618	3413.33	
83	960.511	0.999756	799656	4096.00	
	966.655	0.999780	799676	4551.11	
84	500.000	0.000100	133010	1001.11	

```
972.287
                    0.999805
                                                 5120.00
                                     799695
        978.431
                    0.999829
                                     799716
                                                 5851.43
86
        983.551
                    0.999854
                                     799734
                                                 6826.67
87
        988.671
                    0.999878
                                     799755
                                                 8192.00
88
        991.743
                    0.999890
                                     799765
                                                 9102.22
89
        993.791
                    0.999902
                                     799776
                                                10240.00
        995.327
                    0.999915
                                     799784
                                                11702.86
91
       997.887
                    0.999927
                                    799793
                                                13653.33
92
       1000.959
                    0.999939
                                    799804
                                                16384.00
93
       1001.983
                    0.999945
                                     799810
                                                18204.44
       1002.495
                    0.999951
                                     799814
                                                20480.00
95
       1003.519
                    0.999957
                                     799818
                                                23405.71
96
       1005.055
                    0.999963
                                    799823
                                                27306.67
       1006.591
                    0.999969
                                    799828
                                                32768.00
98
       1007.103
                    0.999973
                                    799830
                                                36408.89
99
       1008.127
                    0.999976
                                    799833
                                                40960.00
100
                    0.999979
                                    799835
101
       1008.639
                                                46811.43
102
       1009.151
                    0.999982
                                     799837
                                                54613.33
       1010.175
                    0.999985
                                     799840
                                                65536.00
       1010.687
                    0.999986
                                    799842
                                                72817.78
104
       1010.687
                    0.999988
                                    799842
                                                81920.00
       1011.199
                    0.999989
                                     799844
106
                                                93622.86
       1011.199
                    0.999991
                                    799844
                                               109226.67
       1011.711
                    0.999992
                                    799845
                                               131072.00
108
109
       1012.223
                    0.999993
                                     799847
                                               145635.56
110
       1012.223
                    0.999994
                                     799847
                                               163840.00
       1012.223
                    0.999995
                                    799847
                                               187245.71
111
      1012.735
                    0.999995
                                    799850
                                               218453.33
112
      1012.735
                    0.999996
                                    799850
                                               262144.00
      1012.735
                                               291271.11
                    0.999997
                                    799850
114
      1012.735
                    0.999997
                                    799850
                                               327680.00
115
       1012.735
                    0.999997
                                    799850
                                               374491.43
116
117
       1012.735
                    0.999998
                                     799850
                                               436906.67
       1012.735
                    0.999998
                                    799850
                                               524288.00
118
      1012.735
                    0.999998
                                    799850
                                               582542.22
119
      1012.735
                    0.999998
                                    799850
                                               655360.00
      1012.735
                    0.999999
                                    799850
                                               748982.86
121
       1013.247
                   0.999999
                                    799851
                                               873813.33
122
      1013.247
                                    799851
                    1.000000
                                                    inf
123
124 #[Mean
                    6.617, StdDeviation
           =
                                                      41.858]
           =
                   1012.736, Total count
125 # [Max
                                              =
                                                       799851]
126 #[Buckets =
                   27, SubBuckets
                                                         2048]
  ______
127
    899861 requests in 1.50m, 63.04MB read
129 Requests/sec: 9998.42
Transfer/sec: 717.29KB
```

```
Running 1m test @ http://localhost:8080
   4 threads and 4 connections
2
   Thread calibration: mean lat.: 3.438ms, rate sampling interval: 16ms
   Thread calibration: mean lat.: 5.724ms, rate sampling interval: 27ms
   Thread calibration: mean lat.: 3.747ms, rate sampling interval: 17ms
   Thread calibration: mean lat.: 6.750ms, rate sampling interval: 32ms
6
   Thread Stats
                                           +/- Stdev
                           Stdev
                                     Max
7
                 Avg
8
     Latency
                 3.97ms
                           5.20ms
                                   59.33ms
                                             89.67%
     Req/Sec
               2.58k
                         628.37
                                7.18k
                                             76.17%
```

```
Latency Distribution (HdrHistogram - Recorded Latency)
   50.000%
                1.97ms
11
   75.000%
                4.93ms
12
   90.000%
                9.35ms
13
   99.000%
               26.19ms
14
   99.900%
               47.42ms
15
   99.990%
               56.77ms
16
   99.999%
               58.69ms
17
               59.36ms
  100.000%
18
19
    Detailed Percentile spectrum:
20
          Value
                    Percentile
                                   TotalCount 1/(1-Percentile)
21
22
          0.073
                      0.000000
                                              4
                                                         1.00
23
                                         50008
          0.564
                      0.100000
                                                         1.11
24
          0.932
                      0.200000
                                        100055
                                                         1.25
25
26
          1.182
                      0.300000
                                        150176
                                                         1.43
27
          1.547
                      0.400000
                                        200037
                                                         1.67
          1.967
                      0.500000
                                        250035
                                                         2.00
28
          2.363
                      0.550000
                                        275042
                                                         2.22
29
          2.855
                      0.600000
                                        300071
                                                         2.50
          3.423
                      0.650000
                                                         2.86
31
                                        325104
          4.103
                      0.700000
                                        350105
                                                         3.33
32
          4.931
                      0.750000
                                        375133
                                                         4.00
33
34
          5.411
                      0.775000
                                        387573
                                                         4.44
                      0.800000
          5.947
                                        400045
                                                         5.00
35
          6.563
                      0.825000
                                        412601
                                                         5.71
36
                                        425056
37
          7.295
                      0.850000
                                                         6.67
          8.179
                      0.875000
                                        437548
                                                         8.00
          8.727
                                        443845
                                                         8.89
                      0.887500
39
          9.351
                      0.900000
                                        450066
                                                        10.00
40
         10.095
                      0.912500
                                        456303
                                                        11.43
41
42
         10.999
                      0.925000
                                        462595
                                                        13.33
         12.095
                      0.937500
                                        468808
                                                        16.00
43
         12.759
                      0.943750
                                        471954
                                                        17.78
44
         13.511
                      0.950000
                                        475056
                                                        20.00
45
         14.431
                      0.956250
                                        478185
                                                        22.86
46
         15.495
                      0.962500
                                        481296
                                                        26.67
47
         16.927
                      0.968750
                                        484421
                                                        32.00
48
         17.807
                      0.971875
                                        486000
                                                        35.56
49
         18.719
                      0.975000
                                        487570
50
                                                        40.00
         19.759
                      0.978125
                                        489113
                                                        45.71
51
                                        490680
         21.039
                      0.981250
                                                        53.33
         22.639
                      0.984375
                                        492243
                                                        64.00
53
         23.567
                      0.985938
                                        493025
                                                        71.11
54
         24.495
                      0.987500
                                        493800
                                                        80.00
         25.503
                      0.989062
                                        494586
                                                        91.43
56
         26.703
                      0.990625
                                        495359
                                                       106.67
57
         28.223
                      0.992188
                                        496144
                                                       128.00
58
         29.183
                      0.992969
                                        496531
                                                       142.22
59
         30.063
                                                       160.00
                      0.993750
                                        496926
60
         31.071
                      0.994531
                                        497313
                                                       182.86
61
         32.287
                      0.995313
                                        497705
                                                       213.33
62
                      0.996094
                                                       256.00
         33.695
                                        498101
63
         34.495
                      0.996484
                                        498290
                                                       284.44
64
         35.551
                      0.996875
                                        498484
                                                       320.00
65
         37.055
                      0.997266
                                        498681
                                                       365.71
66
         38.655
                      0.997656
                                        498876
                                                       426.67
67
                                                       512.00
68
         41.311
                      0.998047
                                        499073
         42.271
                      0.998242
                                        499169
                                                       568.89
69
```

```
43.743
                    0.998437
                                   499265
                                                640.00
        45.055
                    0.998633
                                   499364
                                                731.43
71
        46.303
                    0.998828
                                   499461
                                                853.33
72
        47.583
                                   499559
                                               1024.00
                    0.999023
73
        48.415
                   0.999121
                                   499607
                                               1137.78
74
        49.119
                   0.999219
                                   499658
                                               1280.00
75
76
        49.695
                   0.999316
                                   499706
                                               1462.86
        50.431
                   0.999414
                                   499754
                                               1706.67
77
                   0.999512
        51.295
                                   499802
                                               2048.00
78
        51.839
                   0.999561
                                   499829
                                               2275.56
79
        52.575
                   0.999609
                                   499852
                                               2560.00
80
                                   499876
                                               2925.71
        53.311
                   0.999658
81
        54.303
                   0.999707
                                   499901
                                               3413.33
        54.943
                   0.999756
                                   499924
                                               4096.00
83
        55.263
                   0.999780
                                   499938
                                               4551.11
84
        55.487
                   0.999805
                                   499950
                                               5120.00
85
                   0.999829
                                   499962
                                               5851.43
86
        55.807
87
        56.223
                    0.999854
                                   499973
                                               6826.67
        56.479
                    0.999878
                                   499985
                                               8192.00
88
        56.671
                   0.999890
                                   499992
                                               9102.22
89
        56.799
                                   500000
                   0.999902
                                             10240.00
        56.863
                   0.999915
                                   500006
91
                                             11702.86
        56.895
                   0.999927
                                   500012
                                             13653.33
92
        57.055
                   0.999939
                                             16384.00
                                   500016
93
94
        57.119
                   0.999945
                                   500021
                                              18204.44
        57.151
                   0.999951
                                   500022
                                              20480.00
95
        57.183
                   0.999957
                                   500025
                                              23405.71
96
                                   500029
        57.375
                   0.999963
                                             27306.67
97
        57.471
                   0.999969
                                   500031
                                             32768.00
        57.791
                   0.999973
                                   500033
                                             36408.89
99
        58.047
                   0.999976
                                   500034
                                             40960.00
100
        58.303
                   0.999979
                                   500036
                                              46811.43
101
102
        58.367
                   0.999982
                                   500037
                                              54613.33
        58.495
                   0.999985
                                   500039
                                              65536.00
103
        58.559
                                              72817.78
                   0.999986
                                   500040
104
        58.559
                   0.999988
                                   500040
                                             81920.00
        58.687
                   0.999989
                                   500042
                                             93622.86
106
        58.687
                   0.999991
                                   500042
                                            109226.67
107
                   0.999992
                                   500043
                                            131072.00
        58.783
108
                   0.999993
                                   500043
                                            145635.56
        58.783
        58.783
                   0.999994
                                   500043
                                             163840.00
110
        59.007
                   0.999995
                                   500044
                                             187245.71
111
        59.007
                   0.999995
                                   500044
                                             218453.33
112
        59.199
                   0.999996
                                   500045
                                            262144.00
113
        59.199
                   0.999997
                                   500045
                                            291271.11
114
        59.199
                   0.999997
                                   500045
                                            327680.00
115
        59.199
                   0.999997
                                   500045
                                            374491.43
116
        59.199
                   0.999998
                                   500045
                                             436906.67
117
        59.359
                    0.999998
                                   500046
                                             524288.00
118
                  1.000000
                                               inf
        59.359
                                  500046
119
120 #[Mean =
                    3.968, StdDeviation
                                                    5.201]
                                            =
121 #[Max =
                    59.328, Total count =
                                                    500046]
                 27, SubBuckets
122 #[Buckets =
123
    599952 requests in 1.00m, 41.88MB read
124
   Non-2xx or 3xx responses: 5
125
126 Requests/sec: 9998.66
127 Transfer/sec: 714.67KB
```

5 Выводы

5.1 get empty

Максимальное ожидание для stage 3: 1001.983 Максимальное ожидание для stage 2: 95.80

5.2 put

Максимальное ожидание для stage 3: 1010.68 Максимальное ожидание для stage 2: 1002.495

5.3 get full

Максимальное ожидание для stage 3: 1013.247 Максимальное ожидание для stage 2: 59.359

5.4 delete

Максимальное ожидание для stage 3: 1013.247 Максимальное ожидание для stage 2: 59.359

5.5 В общем

Можно сделать вывод, что в реализации Stage 3 либо допущена какая-то серьезная ошибка, не нарушающая функциональности (так как тесты проходят), однако снижающая производительность на порядок, либо из-за увеличения кол-ва выполняемых действий при обработке запроса и добавления нового уровня абстракции (MemTablePool) скорость обработки запроса неминуемо увеличилась. Второй вариант маловероятен - вряд ли изменения внесённые в Stage 3 должны замедлять работу сервиса, поэтому нужно искать какие-то принципиальные ошибки в коде и исправлять их к следующим этапам.

Ещё одна большая проблема, возникшая в Stage 3 - отсутствие многопоточности в том виде, в котором она должна быть. Если посмотреть на результаты профилирования по СРU, по факту работают всего 1-2 потока. Это очень странно и неправильно и было замечено мной уже в результате написания данного отчёта.

Главный вывод - в ходе выполнения Stage 3 была допущена ошибка, понижающая производительность. Ну что сказать, буду фиксить.