**Report about conducted longevity test**

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**Application:** BlogEngine.NET version 3.2

**Environment:** Host machine where script was run + Virtual Machine where blog is deployed

**Environment configuration (RAM, CPU etc.):**

|  |  |
| --- | --- |
| **RAM** | 4096 MB |
| **CPU** | 1 Core CPU (Intel(R) Core(TM) i7-8665U CPU @ 1.90GHz 2.11 GHz) |
| **System Type** | Windows 10 64-bit |

1. **Why such testing was conducted:** To find possible bottlenecks and issues for long-time running systems.
2. **Test script description:** Current script is combined script of 3 different role user scenarios: Anonymous, Admin and Editor.
   1. **Anonymous Script:** contains different user scenarios which are chosen with different probabilities (Open Home Page, Open Random Date, Open Predefined Date, Search Post by Name, Open large calendar, Open contacts). First three scenarios are opening random page with posts (in 50% cases). All scenarios (except Open Contacts) have Open Page script, which is used randomly in ~80% cases. Detailed description can be found on screenshots and in tables below.
   2. **Admin Script:** contains actions for Admin flow. Firstly “user” opens Home page, Logs In, after that starts loop which executes 10 times: Open Admin Page -> Open Users Page -> depending on current number of users -> Create User OR Delete User. After loop ends “user” will be logged off.
   3. **Editor Script:** contains actions for Editor flow. Firstly “user” opens Home page, Logs In, after that starts loop which executes 50 times: Open Predefined Date -> Open Random Page (in case editable post was not found on first page) -> Open Random Post -> Edit Post. After loop ends “user” will be logged off.

**Diagram

Description automatically generatedDiagram

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Diagram

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# Tests preconditions and configurations

**Test run preconditions:**

* 1000 pregenerated posts on predefined dates
* CSV file with 10 predefined dates
* CSV file with Admin credentials
* CSV file with Editor credentials

**Monitored Key Performance Indicators (KPI):**

* Throughput (transactions per second)
* Error rate, %
* Average response time, ms
* Median response time, ms
* 90% response time, ms
* 95% response time, ms
* Average CPU load, %

**Why that Load Model was chosen:** task 7 test execution showed saturation point on ~90 users, so number of anonymous users was set to 25 users, editor users to 4, and admin users to 1. Overall number of users in that low load model equal to 30.

**Load Model 1:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Users** | **Ramp up (m)** | **Duration (m)** |
| **Anonymous** Users | 25 | 2 | 420 |
| **Admin** Users | 1 |
| **Editor** Users | 4 |

**Load Model 2:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Users** | **Ramp up (m)** | **Duration (m)** |
| **Anonymous** Users | 25 | 2 | 600 |
| **Admin** Users | 1 |
| **Editor** Users | 4 |

**Comparison of Anonymous script step probabilities:**

|  |  |
| --- | --- |
| **Action** | **Probability** |
| Open Home Page | 15% |
| Open Random Date | 10% |
| Open Predefined Date | 30% |
| Search by Name | 30% |
| Open Large Calendar | 10% |
| Open Contacts | 5% |

|  |  |
| --- | --- |
| **Action:** Open Random Page | **Probability** |
| Yes | 50% |
| No | 50% |

|  |  |
| --- | --- |
| **Action:** Open Post | **Probability** |
| Yes | 80% |
| No | 20% |

|  |  |
| --- | --- |
| **Action:** Open First or Random Post | **Probability** |
| First | 35% |
| Random | 65% |

|  |  |
| --- | --- |
| **Action:** Send Comment | **Probability** |
| Yes | 20% |
| No | 80% |

# Short summary on conducted tests:

**Tests with different duration:**

|  |  |  |
| --- | --- | --- |
| **Duration (hours)** | **7** | **10** |
| **Throughput (transactions per sec)** | 9.58 | 9.52 |
| **Error rate, %** | 0.01 | 0.01 |
| **Average response time, ms** | 159.64 | 183.27 |
| **Median response time, ms** | 96.5 | 107 |
| **90%, ms** | 598.7 | 728.3 |
| **95%, ms** | 1227.2 | 1285.2 |
| **Average CPU load, %** | 33.4 | 36.8 |

Key Performance Indicators numbers are similar in both test executions, slightly worse number are observed for 10 hours run due to high CPU load from 14:55 to 15:15, at that moment average response time grown from ~180ms to 400-500ms with its peak at ~2s.

* For 7 hours test we can see highest average response time at the moments when CPU reaches 100% which happens at 00:14, 00:22 and 03:07. One more peak of average response time was at 23:00, at that time application switched from w3wp to w3wp#1 instance. Free RAM had huge drop (from 1.7 GB to 1.25 GB) at 00:22, and before that, from 00:00 to 00:15, memory usage had period of higher values. Another peak of memory usage was at 01:18-01:20, and at the same time CPU load reached 70% instead of average 33%; also, Disk Read time at that time grown up to ~60%. Free Space on Disk decreased from 30.5 to 29.6 GB during that test run.
* For 10 hours test we have only one significant moment when metrics are not behaving normally which is noted earlier, from 14:55 to 15:15. At that moment CPU load reached 80-100% instead of average 36%, in result of that response time was increased and throughput decreased. Free RAM was decreasing during whole test run and it had significant instantaneous drop at 18:50. Memory usage also has grown up at that time; the same for Disk usage, especially it relates to Disk Read time, which grown to 10% for that period with its peak at 50% while it had extremely low percentage (~0.5%) during almost whole test except that moment. Meanwhile Garbage Collector, Heap and Cache did not have any changes to their behavior at that period. During that 10h test run Free Space on Disk decreased from 29.6 to 27.8 GB.

# Detailed test results:

## 7 hours execution

**Composite Graph (Active Threads, Throughput, Average Response Time, Errors per sec)**

Chart

Description automatically generated

**Aggregate Report**

A picture containing text, outdoor, electronics, computer

Description automatically generated

**All transaction response times**

Chart, histogram

Description automatically generated

Almost all response time spikes happened at the moment CPU had spikes as well, except spikes at 23:00 and 00:28, as they are related to w3wp/w3wp#1 switch.

**CPU load**

Chart, histogram

Description automatically generated

**Memory usage**

A picture containing graphical user interface

Description automatically generated

**Garbage Collector and heap**

A screenshot of a computer

Description automatically generated with medium confidence

2 switches from w3wp to w3wp#1 happened: 1st from 23:00 to 23:20 and 2nd from 00:30 to 00:50.

**Cache**

A screenshot of a computer

Description automatically generated with medium confidence

**Disk**

A screenshot of a computer

Description automatically generated with medium confidence

## 10 hours execution

**Composite Graph (Active Threads, Throughput, Average Response Time, Errors per sec)**

Graphical user interface, chart

Description automatically generated

**Aggregate Report**

A picture containing text, outdoor, computer, electronics

Description automatically generated

**All transaction response times**

Chart, histogram

Description automatically generated

Highest average response time spike is observed at the moment when CPU had its 80-100% load.

**CPU load**

Chart, histogram

Description automatically generated

**Memory usage**

Chart

Description automatically generated

**Garbage Collector and heap**

A screenshot of a computer

Description automatically generated with medium confidence

**Cache**

A screenshot of a computer

Description automatically generated with medium confidence

**Disk**

A screenshot of a computer

Description automatically generated with medium confidence

# Conclusion:

* We executed 2 long-time tests: for 7 and 10 hours.
* Average CPU load equals to 35% which is evidence of low load.
* Free RAM is decreasing during both test executions, and after total 17 hours of tests it dropped from 1.9GB to 1GB. That can indicate us about possible issues when free RAM space will be closing to zero. **Some actions to free up RAM during application work are required.**
* Disk free space shortened by 0.9 GB in 7h run and by 1.8GB in 10h run, which means our test creates ~160 MB of data per hour and after some time there could be a situation where Disk does not have enough space and users will not be able to add any data to Blog.
* Garbage Collector works as expected, while looking on the Heap we can see that Gen 2 has the highest value in both test runs, which indicates us about **possible memory issues**.
* Extra tests with longer duration (24 or 48 hours) can make memory and disk issues more obvious.