Concurrent Symbol Table

Multi-Threaded Performance Analysis

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The following analysis is from the data collected at the end of this document. The data was collected with the *time* command and running two programs, mostUsed and uniqueCount, which utilize a symtable with different support for multithreading. The table supports a single lock, locking groups of buckets in the hash table, the use of thin locks, and concurrent reading of the table. The data includes the averages of 10 runs for each concurrency supported, with either 2 or 8 threads, for both programs. The number of buckets in the table is 10,000 for all tests.
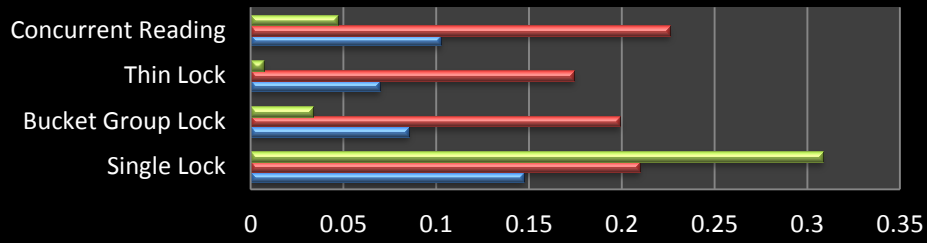
## Unique Count - Eight Threads
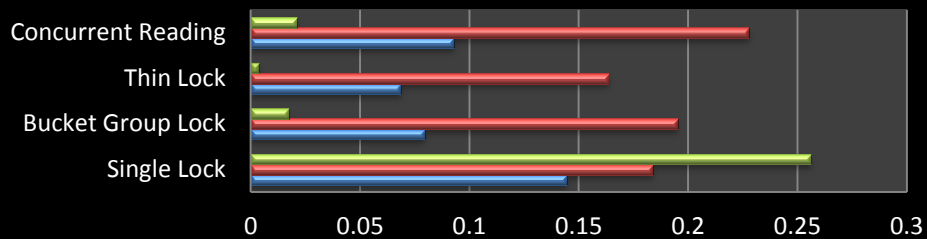


|  | Single Lock | Bucket Group Lock | Thin Lock | Concurrent Reading |
|---|---|---|---|---|
| ave sys | 0.255909091 | 0.017363636 | 0.0036 | 0.0213 |
| ave user | 0.183636364 | 0.195090909 | 0.1635 | 0.2277 |
| ave real | 0.144454545 | 0.079272727 | 0.0688 | 0.0927 |

## Unique Count - Two Threads
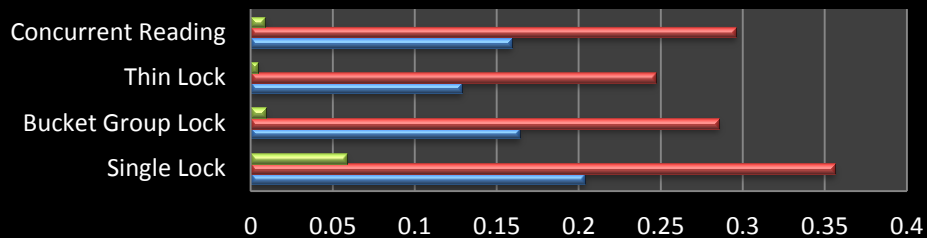


|  | Single Lock | Bucket Group Lock | Thin Lock | Concurrent Reading |
|---|---|---|---|---|
| ave sys | 0.0586 | 0.0092 | 0.0045 | 0.0089 |
| ave user | 0.356 | 0.2852 | 0.247 | 0.2956 |
| ave real | 0.2039 | 0.164 | 0.1285 | 0.1591 |

## Most Used - Eight Threads



|  | Single Lock | Bucket Group Lock | Thin Lock | Concurrent Reading |
|---|---|---|---|---|
| ave sys | 0.3083 | 0.033363636 | 0.0068 | 0.0467 |
| ave user | 0.2098 | 0.198818182 | 0.174 | 0.2259 |
| ave real | 0.147 | 0.085272727 | 0.0695 | 0.1022 |

## Most Used - Two Threads
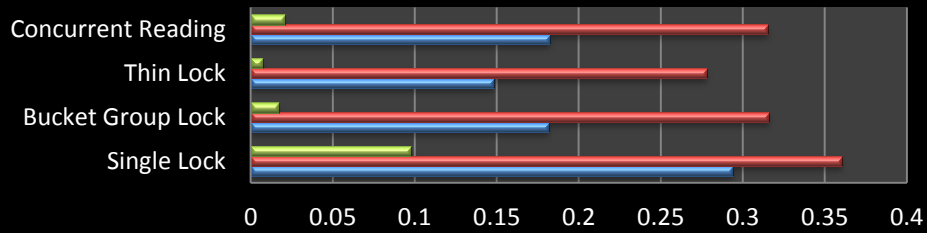


|  | Single Lock | Bucket Group Lock | Thin Lock | Concurrent Reading |
|---|---|---|---|---|
| ave sys | 0.0973 | 0.0172 | 0.0074 | 0.0205 |
| ave user | 0.3605 | 0.3157 | 0.2779 | 0.3152 |
| ave real | 0.2939 | 0.1815 | 0.1482 | 0.1822 |

Analysis:

Consistently thin locks were the fastest throughout all of the tests. I think this has to do with the fact there was little contention between what buckets were being accessed by the threads and being a lighter weight lock, the thin locks performed even faster than a mutex lock. The average 'real' time trend did not fluctuate significantly. Single lock was consistently the slowest. This is because all buckets were locked for reading and writing when symtabUpdate or symtabLookup was called. The next interesting bit of data is in regards to the concurrent reads and bucket group lock. Unique Count with eight threads, which relies heavily on symtabLookup, performed better with concurrent reads than lock bucket groups. I believe this is due to the fact most calls for that program are reads rather than writes, so it allows a more free flow of information to be processed, without having to stop for many writes. All other tests done have concurrent reads slower than the locking of entire bucket groups. I believe this to be the case because when there needs to be a writer thread in that mode, you cannot read from another thread or write from another thread, therefore halting the concurrency. And again, the fastest concurrency supported was the thin locks. Not only did the thin locks benefit from the same bucket-group division the mutex version had, but thin locks are also a much lighter weight.

| files | program | con sup | Threads | Buckets | real | user | sys |
|---|---|---|---|---|---|---|---|
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 1 | 8 | 10000 | 0.324 | 0.134 | 0.012 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 1 | 8 | 10000 | 0.124 | 0.185 | 0.277 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 1 | 8 | 10000 | 0.128 | 0.177 | 0.29 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 1 | 8 | 10000 | 0.127 | 0.182 | 0.288 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 1 | 8 | 10000 | 0.124 | 0.21 | 0.248 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 1 | 8 | 10000 | 0.127 | 0.205 | 0.262 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 1 | 8 | 10000 | 0.127 | 0.179 | 0.295 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 1 | 8 | 10000 | 0.128 | 0.193 | 0.281 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 1 | 8 | 10000 | 0.127 | 0.205 | 0.259 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 1 | 8 | 10000 | 0.13 | 0.19 | 0.298 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 1 | 8 | 10000 | 0.123 | 0.16 | 0.305 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 2 | 8 | 10000 | 0.077 | 0.202 | 0.008 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 2 | 8 | 10000 | 0.08 | 0.194 | 0.019 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 2 | 8 | 10000 | 0.078 | 0.197 | 0.017 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 2 | 8 | 10000 | 0.074 | 0.187 | 0.017 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 2 | 8 | 10000 | 0.081 | 0.194 | 0.023 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 2 | 8 | 10000 | 0.082 | 0.193 | 0.026 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 2 | 8 | 10000 | 0.08 | 0.187 | 0.029 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 2 | 8 | 10000 | 0.08 | 0.197 | 0.01 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 2 | 8 | 10000 | 0.081 | 0.196 | 0.015 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 2 | 8 | 10000 | 0.079 | 0.203 | 0.014 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 2 | 8 | 10000 | 0.08 | 0.196 | 0.013 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 4 | 8 | 10000 | 0.068 | 0.166 | 0.003 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 4 | 8 | 10000 | 0.069 | 0.16 | 0.002 |
| alice hound oz arthur poirot varney dickens | uniqueCount | 4 | 8 | 10000 | 0.068 | 0.167 | 0.002 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| hasty alice hound oz arthur poirot varney dickens hasty | uniqueCount | 4 | 8 | 10000 | 0.07 | 0.165 | 0.002 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 4 | 8 | 10000 | 0.069 | 0.162 | 0.004 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 4 | 8 | 10000 | 0.07 | 0.159 | 0.009 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 4 | 8 | 10000 | 0.068 | 0.164 | 0.003 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 4 | 8 | 10000 | 0.068 | 0.16 | 0.005 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 4 | 8 | 10000 | 0.067 | 0.171 | 0.003 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 4 | 8 | 10000 | 0.071 | 0.161 | 0.003 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 3 | 8 | 10000 | 0.092 | 0.229 | 0.018 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 3 | 8 | 10000 | 0.093 | 0.233 | 0.011 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 3 | 8 | 10000 | 0.09 | 0.223 | 0.021 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 3 | 8 | 10000 | 0.094 | 0.225 | 0.023 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 3 | 8 | 10000 | 0.093 | 0.226 | 0.025 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 3 | 8 | 10000 | 0.094 | 0.221 | 0.03 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 3 | 8 | 10000 | 0.093 | 0.24 | 0.013 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 3 | 8 | 10000 | 0.091 | 0.221 | 0.026 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 3 | 8 | 10000 | 0.094 | 0.238 | 0.016 |
| alice hound oz arthur poirot varney dickens hasty | uniqueCount | 3 | 8 | 10000 | 0.093 | 0.221 | 0.03 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 1 | 8 | 10000 | 0.149 | 0.216 | 0.303 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 1 | 8 | 10000 | 0.123 | 0.225 | 0.191 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 1 | 8 | 10000 | 0.153 | 0.219 | 0.316 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 1 | 8 | 10000 | 0.153 | 0.196 | 0.344 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 1 | 8 | 10000 | 0.147 | 0.207 | 0.319 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 1 | 8 | 10000 | 0.152 | 0.194 | 0.336 |
| alice hound oz arthur poirot varney dickens | mostUsed | 1 | 8 | 10000 | 0.146 | 0.199 | 0.325 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| hasty | | | | | | | |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 1 | 8 | 10000 | 0.15 | 0.236 | 0.3 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 1 | 8 | 10000 | 0.154 | 0.198 | 0.341 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 1 | 8 | 10000 | 0.143 | 0.208 | 0.308 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 2 | 8 | 10000 | 0.088 | 0.206 | 0.022 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 2 | 8 | 10000 | 0.083 | 0.195 | 0.02 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 2 | 8 | 10000 | 0.086 | 0.209 | 0.016 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 2 | 8 | 10000 | 0.087 | 0.184 | 0.036 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 2 | 8 | 10000 | 0.084 | 0.2 | 0.02 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 2 | 8 | 10000 | 0.085 | 0.196 | 0.021 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 2 | 8 | 10000 | 0.085 | 0.196 | 0.028 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 2 | 8 | 10000 | 0.083 | 0.206 | 0.016 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 2 | 8 | 10000 | 0.085 | 0.192 | 0.031 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 2 | 8 | 10000 | 0.085 | 0.191 | 0.027 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 2 | 8 | 10000 | 0.087 | 0.212 | 0.13 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 4 | 8 | 10000 | 0.073 | 0.175 | 0.006 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 4 | 8 | 10000 | 0.072 | 0.17 | 0.01 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 4 | 8 | 10000 | 0.079 | 0.179 | 0.009 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 4 | 8 | 10000 | 0.074 | 0.171 | 0.004 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 4 | 8 | 10000 | 0.072 | 0.176 | 0.011 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 4 | 8 | 10000 | 0.03 | 0.171 | 0.006 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 4 | 8 | 10000 | 0.074 | 0.179 | 0.003 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 4 | 8 | 10000 | 0.074 | 0.175 | 0.007 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 4 | 8 | 10000 | 0.073 | 0.173 | 0.005 |
| alice hound oz arthur poirot varney dickens | mostUsed | 4 | 8 | 10000 | 0.074 | 0.171 | 0.007 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| hasty | | | | | | | |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 3 | 8 | 10000 | 0.109 | 0.241 | 0.045 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 3 | 8 | 10000 | 0.107 | 0.231 | 0.046 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 3 | 8 | 10000 | 0.102 | 0.221 | 0.05 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 3 | 8 | 10000 | 0.104 | 0.238 | 0.042 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 3 | 8 | 10000 | 0.102 | 0.222 | 0.058 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 3 | 8 | 10000 | 0.1 | 0.211 | 0.062 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 3 | 8 | 10000 | 0.101 | 0.232 | 0.036 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 3 | 8 | 10000 | 0.089 | 0.212 | 0.026 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 3 | 8 | 10000 | 0.105 | 0.22 | 0.052 |
| alice hound oz arthur poirot varney dickens hasty | mostUsed | 3 | 8 | 10000 | 0.103 | 0.231 | 0.05 |
| lesmis war-and-peace | uniqueCount | 1 | 2 | 10000 | 0.165 | 0.266 | 0.035 |
| lesmis war-and-peace | uniqueCount | 1 | 2 | 10000 | 0.166 | 0.253 | 0.05 |
| lesmis war-and-peace | uniqueCount | 1 | 2 | 10000 | 0.236 | 0.326 | 0.061 |
| lesmis war-and-peace | uniqueCount | 1 | 2 | 10000 | 0.222 | 0.308 | 0.064 |
| lesmis war-and-peace | uniqueCount | 1 | 2 | 10000 | 0.208 | 0.281 | 0.076 |
| lesmis war-and-peace | uniqueCount | 1 | 2 | 10000 | 0.216 | 0.294 | 0.071 |
| lesmis war-and-peace | uniqueCount | 1 | 2 | 10000 | 0.165 | 0.268 | 0.035 |
| lesmis war-and-peace | uniqueCount | 1 | 2 | 10000 | 0.236 | 0.309 | 0.079 |
| lesmis war-and-peace | uniqueCount | 1 | 2 | 10000 | 0.207 | 0.95 | 0.052 |
| lesmis war-and-peace | uniqueCount | 1 | 2 | 10000 | 0.218 | 0.305 | 0.063 |
| lesmis war-and-peace | uniqueCount | 2 | 2 | 10000 | 0.159 | 0.284 | 0.016 |
| lesmis war-and-peace | uniqueCount | 2 | 2 | 10000 | 0.159 | 0.29 | 0.009 |
| lesmis war-and-peace | uniqueCount | 2 | 2 | 10000 | 0.179 | 0.312 | 0.006 |
| lesmis war-and-peace | uniqueCount | 2 | 2 | 10000 | 0.161 | 0.29 | 0.012 |
| lesmis war-and-peace | uniqueCount | 2 | 2 | 10000 | 0.16 | 0.293 | 0.006 |
| lesmis war-and-peace | uniqueCount | 2 | 2 | 10000 | 0.187 | 0.226 | 0.005 |
| lesmis war-and-peace | uniqueCount | 2 | 2 | 10000 | 0.16 | 0.29 | 0.011 |
| lesmis war-and-peace | uniqueCount | 2 | 2 | 10000 | 0.159 | 0.292 | 0.006 |
| lesmis war-and-peace | uniqueCount | 2 | 2 | 10000 | 0.159 | 0.288 | 0.011 |
| lesmis war-and-peace | uniqueCount | 2 | 2 | 10000 | 0.157 | 0.287 | 0.01 |
| lesmis war-and-peace | uniqueCount | 4 | 2 | 10000 | 0.145 | 0.264 | 0.005 |
| lesmis war-and-peace | uniqueCount | 4 | 2 | 10000 | 0.134 | 0.249 | 0.006 |
| lesmis war-and-peace | uniqueCount | 4 | 2 | 10000 | 0.133 | 0.253 | 0.002 |
| lesmis war-and-peace | uniqueCount | 4 | 2 | 10000 | 0.12 | 0.226 | 0.004 |
| lesmis war-and-peace | uniqueCount | 4 | 2 | 10000 | 0.134 | 0.252 | 0.004 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| lesmis war-and-peace | uniqueCount | 4 | 2 | 10000 | 0.087 | 0.216 | 0.009 |
| lesmis war-and-peace | uniqueCount | 4 | 2 | 10000 | 0.133 | 0.252 | 0.004 |
| lesmis war-and-peace | uniqueCount | 4 | 2 | 10000 | 0.133 | 0.254 | 0.003 |
| lesmis war-and-peace | uniqueCount | 4 | 2 | 10000 | 0.134 | 0.253 | 0.003 |
| lesmis war-and-peace | uniqueCount | 4 | 2 | 10000 | 0.132 | 0.251 | 0.005 |
| lesmis war-and-peace | uniqueCount | 3 | 2 | 10000 | 0.141 | 0.269 | 0.006 |
| lesmis war-and-peace | uniqueCount | 3 | 2 | 10000 | 0.137 | 0.259 | 0.007 |
| lesmis war-and-peace | uniqueCount | 3 | 2 | 10000 | 0.137 | 0.257 | 0.009 |
| lesmis war-and-peace | uniqueCount | 3 | 2 | 10000 | 0.181 | 0.338 | 0.005 |
| lesmis war-and-peace | uniqueCount | 3 | 2 | 10000 | 0.136 | 0.261 | 0.005 |
| lesmis war-and-peace | uniqueCount | 3 | 2 | 10000 | 0.14 | 0.264 | 0.006 |
| lesmis war-and-peace | uniqueCount | 3 | 2 | 10000 | 0.181 | 0.319 | 0.022 |
| lesmis war-and-peace | uniqueCount | 3 | 2 | 10000 | 0.179 | 0.331 | 0.008 |
| lesmis war-and-peace | uniqueCount | 3 | 2 | 10000 | 0.179 | 0.326 | 0.013 |
| lesmis war-and-peace | uniqueCount | 3 | 2 | 10000 | 0.18 | 0.332 | 0.008 |
| lesmis war-and-peace | mostUsed | 1 | 2 | 10000 | 0.206 | 0.292 | 0.072 |
| lesmis war-and-peace | mostUsed | 1 | 2 | 10000 | 0.313 | 0.366 | 0.107 |
| lesmis war-and-peace | mostUsed | 1 | 2 | 10000 | 0.327 | 0.394 | 0.104 |
| lesmis war-and-peace | mostUsed | 1 | 2 | 10000 | 0.329 | 0.379 | 0.12 |
| lesmis war-and-peace | mostUsed | 1 | 2 | 10000 | 0.207 | 0.305 | 0.06 |
| lesmis war-and-peace | mostUsed | 1 | 2 | 10000 | 0.283 | 0.349 | 0.083 |
| lesmis war-and-peace | mostUsed | 1 | 2 | 10000 | 0.307 | 0.374 | 0.099 |
| lesmis war-and-peace | mostUsed | 1 | 2 | 10000 | 0.321 | 0.377 | 0.113 |
| lesmis war-and-peace | mostUsed | 1 | 2 | 10000 | 0.324 | 0.38 | 0.111 |
| lesmis war-and-peace | mostUsed | 1 | 2 | 10000 | 0.322 | 0.389 | 0.104 |
| lesmis war-and-peace | mostUsed | 2 | 2 | 10000 | 0.183 | 0.316 | 0.019 |
| lesmis war-and-peace | mostUsed | 2 | 2 | 10000 | 0.178 | 0.313 | 0.018 |
| lesmis war-and-peace | mostUsed | 2 | 2 | 10000 | 0.182 | 0.321 | 0.014 |
| lesmis war-and-peace | mostUsed | 2 | 2 | 10000 | 0.181 | 0.306 | 0.026 |
| lesmis war-and-peace | mostUsed | 2 | 2 | 10000 | 0.184 | 0.316 | 0.018 |
| lesmis war-and-peace | mostUsed | 2 | 2 | 10000 | 0.178 | 0.317 | 0.013 |
| lesmis war-and-peace | mostUsed | 2 | 2 | 10000 | 0.183 | 0.314 | 0.019 |
| lesmis war-and-peace | mostUsed | 2 | 2 | 10000 | 0.186 | 0.322 | 0.013 |
| lesmis war-and-peace | mostUsed | 2 | 2 | 10000 | 0.178 | 0.312 | 0.018 |
| lesmis war-and-peace | mostUsed | 2 | 2 | 10000 | 0.182 | 0.32 | 0.014 |
| lesmis war-and-peace | mostUsed | 4 | 2 | 10000 | 0.149 | 0.278 | 0.008 |
| lesmis war-and-peace | mostUsed | 4 | 2 | 10000 | 0.148 | 0.284 | 0.003 |
| lesmis war-and-peace | mostUsed | 4 | 2 | 10000 | 0.148 | 0.274 | 0.011 |
| lesmis war-and-peace | mostUsed | 4 | 2 | 10000 | 0.149 | 0.279 | 0.006 |
| lesmis war-and-peace | mostUsed | 4 | 2 | 10000 | 0.149 | 0.28 | 0.006 |
| lesmis war-and-peace | mostUsed | 4 | 2 | 10000 | 0.148 | 0.279 | 0.007 |
| lesmis war-and-peace | mostUsed | 4 | 2 | 10000 | 0.149 | 0.278 | 0.008 |
| lesmis war-and-peace | mostUsed | 4 | 2 | 10000 | 0.147 | 0.278 | 0.007 |
| lesmis war-and-peace | mostUsed | 4 | 2 | 10000 | 0.146 | 0.272 | 0.01 |
| lesmis war-and-peace | mostUsed | 4 | 2 | 10000 | 0.149 | 0.277 | 0.008 |

| lesmis war-and-peace | | mostUsed | 3 | 2 | 10000 | 0.21 | 0.353 | 0.028 |
|---|---|---|---|---|---|---|---|---|
| lesmis war-and-peace | | mostUsed | 3 | 2 | 10000 | 0.147 | 0.272 | 0.009 |
| lesmis war-and-peace | | mostUsed | 3 | 2 | 10000 | 0.191 | 0.331 | 0.02 |
| lesmis war-and-peace | | mostUsed | 3 | 2 | 10000 | 0.215 | 0.36 | 0.027 |
| lesmis war-and-peace | | mostUsed | 3 | 2 | 10000 | 0.22 | 0.354 | 0.035 |
| lesmis war-and-peace | | mostUsed | 3 | 2 | 10000 | 0.145 | 0.271 | 0.009 |
| lesmis war-and-peace | | mostUsed | 3 | 2 | 10000 | 0.144 | 0.259 | 0.019 |
| lesmis war-and-peace | | mostUsed | 3 | 2 | 10000 | 0.182 | 0.314 | 0.025 |
| lesmis war-and-peace | | mostUsed | 3 | 2 | 10000 | 0.149 | 0.279 | 0.005 |
| lesmis war-and-peace | | mostUsed | 3 | 2 | 10000 | 0.219 | 0.359 | 0.028 |