

# mod-search performance baselines

## Purpose

Establish a baseline for the most common searches that the users might conduct. The performance baseline includes search by: keyword, title, subject, contributor, queries with boolean operations and filters.

All search operations performed for 1, 10, 20, 50, 100 simultaneous users.

## Approach

Index bugfest-iris dataset at <https://falcon-perf-okapi.ci.folio.org> and execute list of queries to estimate current performance of mod-search application.

## Performance test configuration

| Property        | Value                                                                                                                                                          |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environment     | <a href="https://falcon-perf-okapi.ci.folio.org">https://falcon-perf-okapi.ci.folio.org</a>                                                                    |
| mod-search      | 2 nodes with CPU limit = 256m and memoryLimit = 536MB                                                                                                          |
| okapi           | 3 nodes with CPU limit = 256m and memoryLimit = 536MB                                                                                                          |
| mod-authtoken   | 2 nodes with CPU limit = 128m and memoryLimit = 360MB                                                                                                          |
| mod-login       | 2 nodes with CPU limit = 128m and memoryLimit = 536MB                                                                                                          |
| mod-permissions | 2 nodes with CPU limit = 128m and memoryLimit = 536MB                                                                                                          |
| ElasticSearch   | <b>AWS based</b><br><br>Number of nodes: 4<br><br>Resources: r6g.large, 16 GiB of Memory, 2 vCPUs, EBS only, 64-bit Arm platform<br><br>Properties: timeout=30 |

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Search queries            | <p><b>Keyword search</b></p> <pre>@keyword = "climate ch*" @keyword all "*climate change*" @keyword = "*depression*" @keyword = "depress*" @keyword = "covid*" @keyword = "*covid-19*"</pre> <p><b>Title search</b></p> <pre>title = "climate ch*" title all "*climate change*" title = "*depression*" title = "depress*" title = "covid*" title = "*covid-19*"</pre> <p><b>Subjects search</b></p> <pre>subjects = "climate ch*" subjects all "*climate change*" subjects = "*depression*" subjects = "depress*" subjects = "covid*" subjects = "*covid-19*"</pre> <p><b>Contributors search</b></p> <pre>contributors = "climate ch*" contributors all "*climate change*" contributors = "*depression*" contributors = "depress*" contributors = "covid*" contributors = "*covid-19*"</pre> <p><b>Boolean search</b></p> <pre>subjects all "washington" AND title all "international travel" subjects all "washington" OR title all "international travel" subjects = ("History" OR "Music") subjects all "washington" NOT title all "international travel"</pre> <p><b>Filter search</b></p> <pre>languages == "eng" languages == ("eng" OR "fre" OR "ita" OR "ukr") languages == "eng" AND items.status.name == "Available" languages == ("eng" OR "fre") AND items.status.name == ("Available" OR "In transit") keyword all "water in africa" AND languages == "eng"</pre> |
| Count of resources        | ~7,6 millions (bugfest-iris dataset)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Performance Test duration | 180 (3 min)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| V_USERS                   | 1-100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| RAMP_UP                   | 1-40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| HOSTNAME                  | <a href="http://falcon-perf-okapi.ci.folio.org">falcon-perf-okapi.ci.folio.org</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Errors

All error in test results means that mod-search received response from ElasticSearch:

"Exception happened: Error raised when there was an exception while talking to ES. ConnectionError: Read timed out. (read timeout=30))"

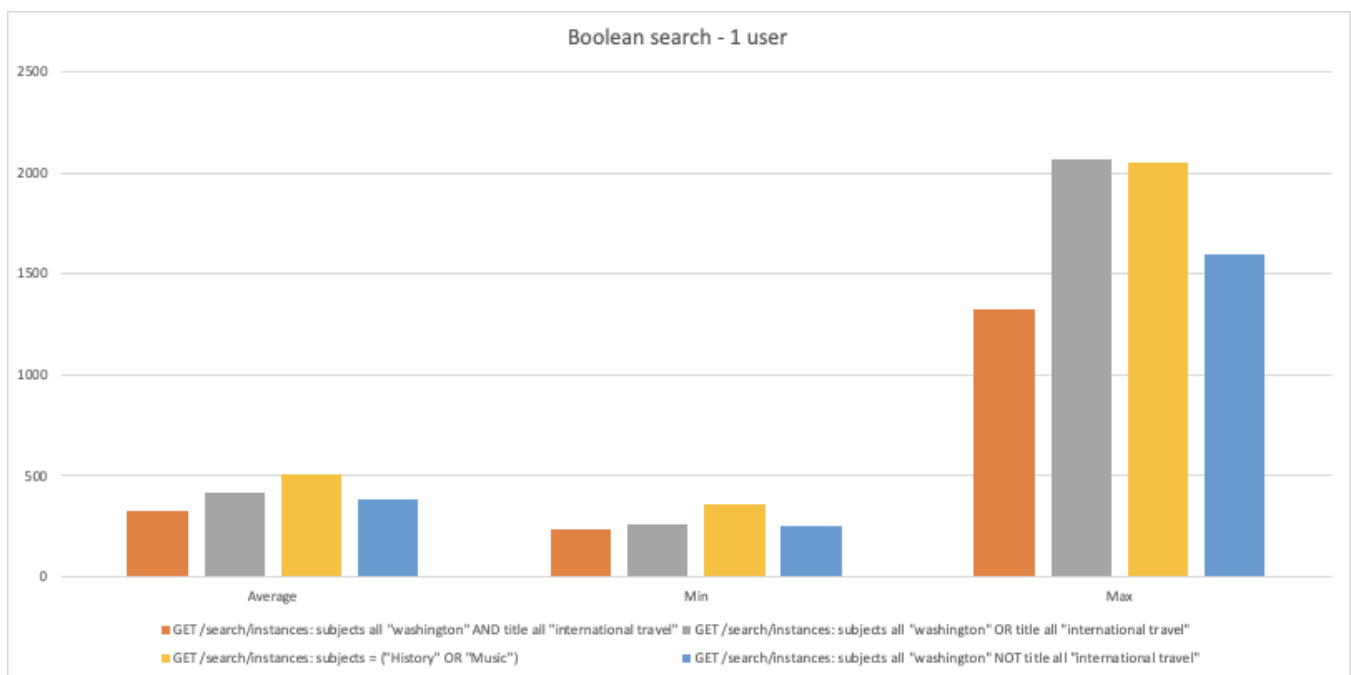
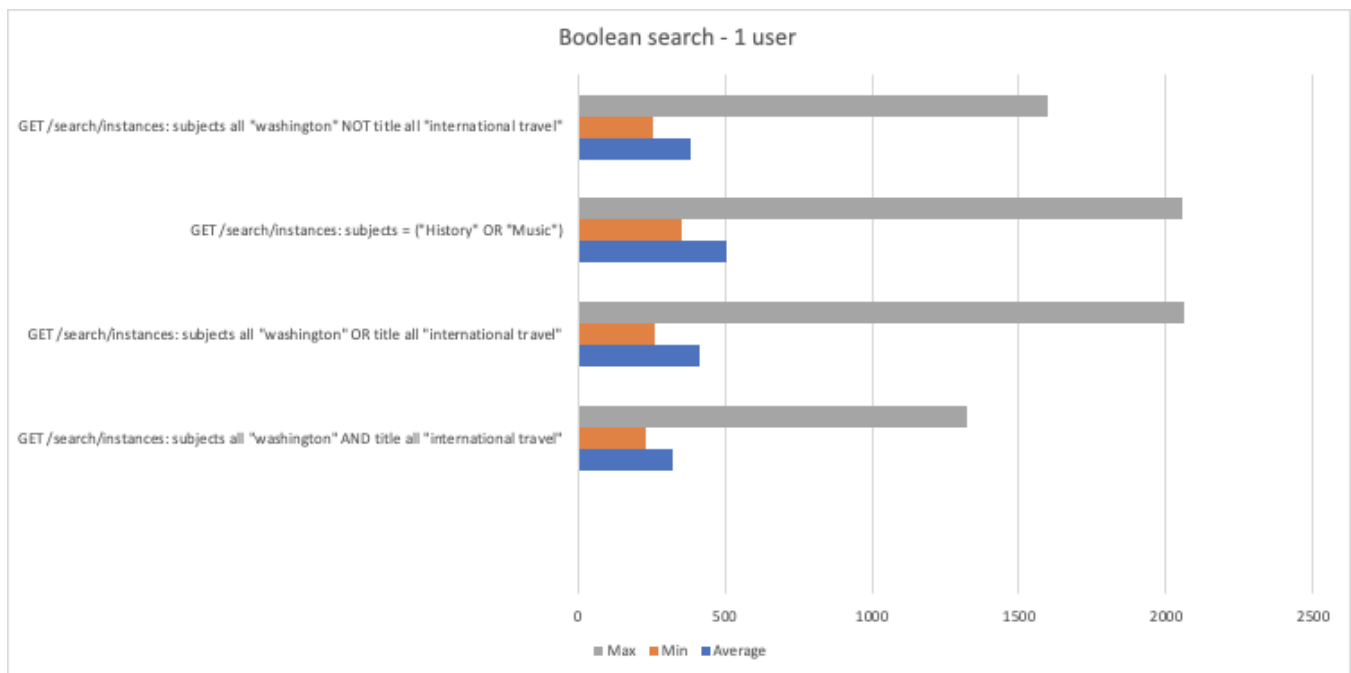
After it, mod-search proxying error to the client in response. It means that the search performed longer than the timeout set up for ES.

## Aggregated results for 1 user

### Boolean search

| Label | Samples | Average | Min | Max | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|-------|---------|---------|-----|-----|-----------|---------|------------|-----------------|-------------|
|-------|---------|---------|-----|-----|-----------|---------|------------|-----------------|-------------|

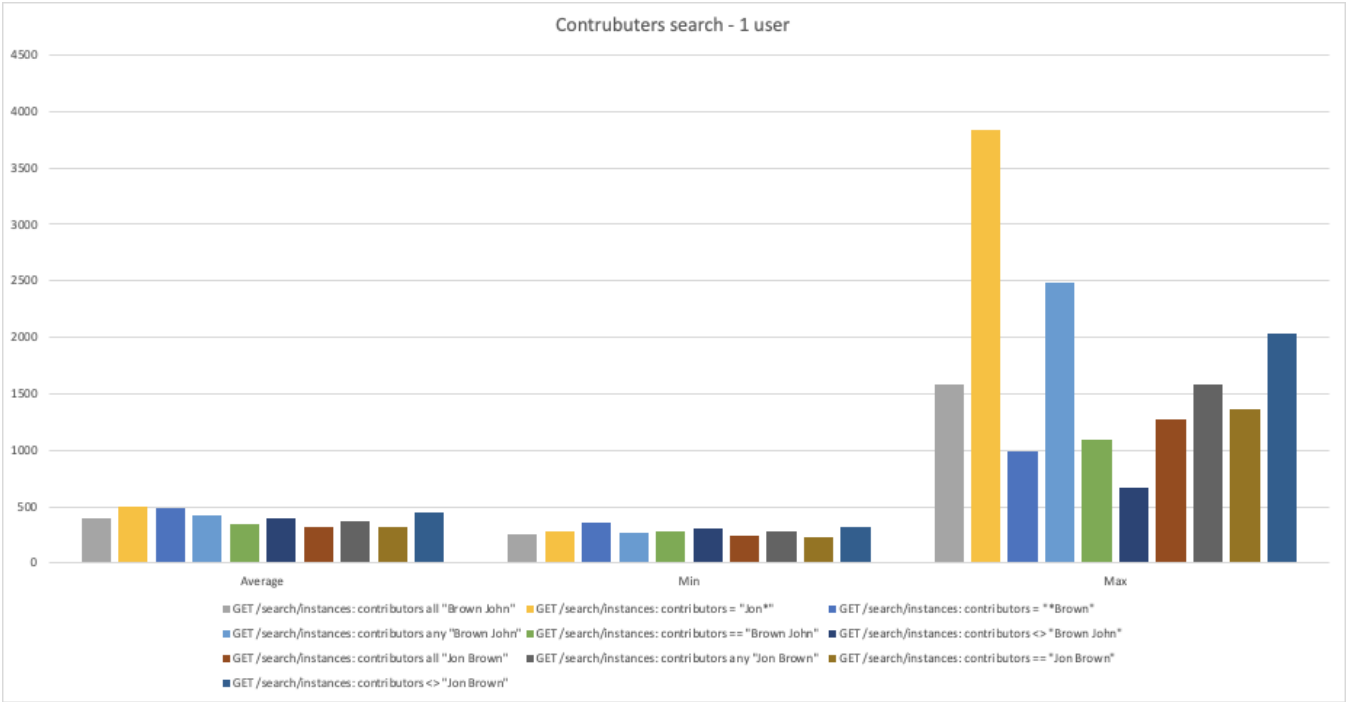
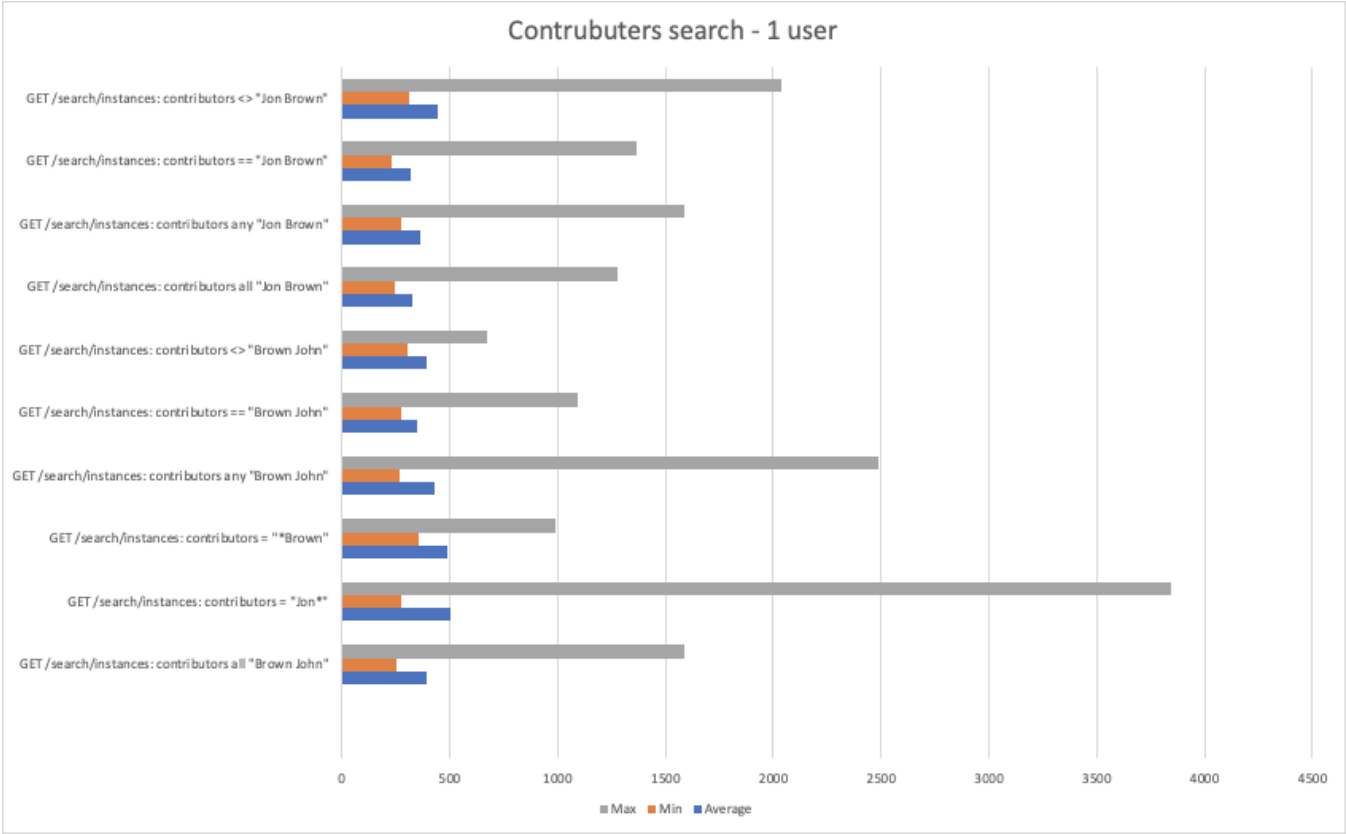
|                                                                                       |            |            |            |             |               |               |                |              |             |
|---------------------------------------------------------------------------------------|------------|------------|------------|-------------|---------------|---------------|----------------|--------------|-------------|
| GET /search/instances: subjects all "washington" AND title all "international travel" | 110        | 323        | 232        | 1325        | 135,31        | 0.000%        | 0,61515        | 1,33         | 0,33        |
| GET /search/instances: subjects all "washington" OR title all "international travel"  | 110        | 417        | 259        | 2064        | 206,23        | 0.000%        | 0,61753        | 20,86        | 0,33        |
| GET /search/instances: subjects = ("History" OR "Music")                              | 110        | 508        | 356        | 2053        | 272,69        | 0.000%        | 0,61914        | 20,41        | 0,32        |
| GET /search/instances: subjects all "washington" NOT title all "international travel" | 110        | 381        | 253        | 1595        | 166,43        | 0.000%        | 0,62093        | 20,54        | 0,33        |
| <b>TOTAL</b>                                                                          | <b>441</b> | <b>410</b> | <b>232</b> | <b>2064</b> | <b>219,69</b> | <b>0.000%</b> | <b>2,42689</b> | <b>61,74</b> | <b>1,29</b> |



## Contributors search

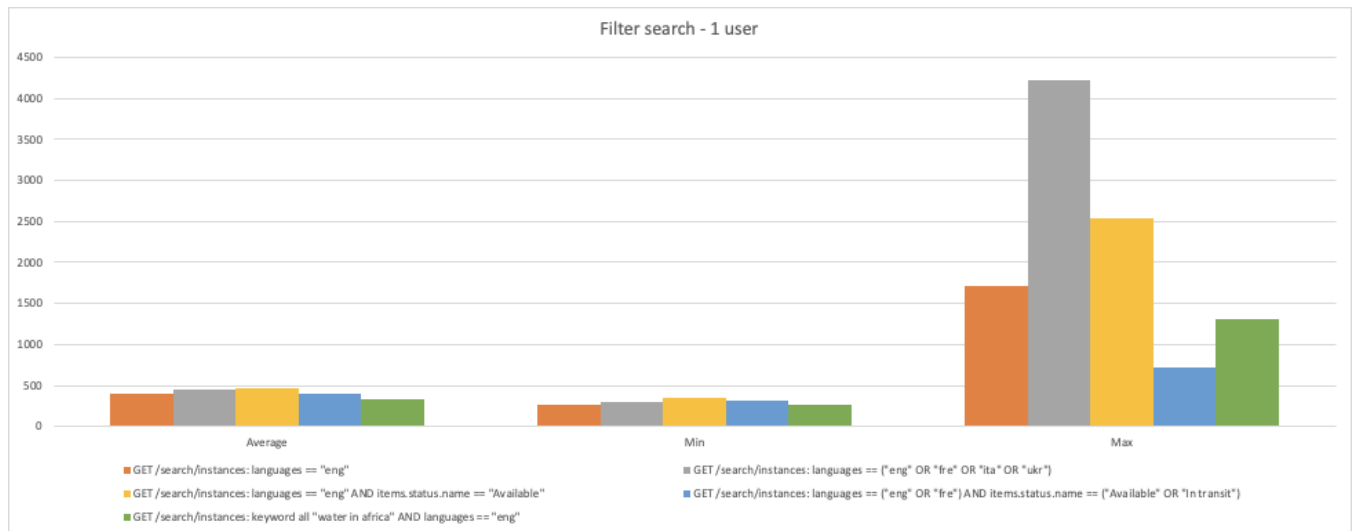
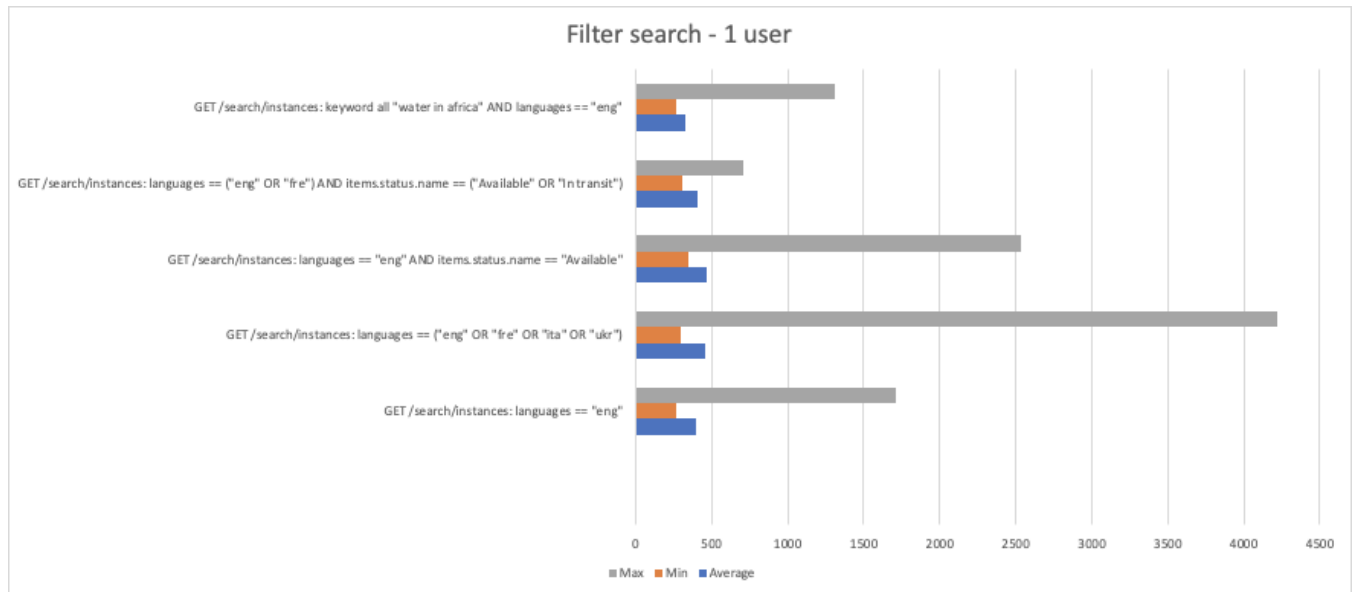
| Label                                                | Samples | Average | Min | Max  | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|------------------------------------------------------|---------|---------|-----|------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: contributors all "Brown John" | 45      | 394     | 249 | 1586 | 218,14    | 0.000%  | 0,25293    | 9,71            | 0,13        |
| GET /search/instances: contributors = "Jon*"         | 45      | 503     | 278 | 3842 | 529,84    | 0.000%  | 0,25432    | 10,31           | 0,13        |
| GET /search/instances: contributors = "*Brown"       | 45      | 490     | 357 | 991  | 145,08    | 0.000%  | 0,2594     | 10,76           | 0,13        |

|                                                      |            |            |            |             |               |               |                |              |             |
|------------------------------------------------------|------------|------------|------------|-------------|---------------|---------------|----------------|--------------|-------------|
| GET /search/instances: contributors any "Brown John" | 45         | 429        | 267        | 2486        | 369,59        | 0.000%        | 0,26009        | 9,99         | 0,13        |
| GET /search/instances: contributors == "Brown John"  | 45         | 348        | 275        | 1092        | 138           | 0.000%        | 0,26057        | 9,79         | 0,13        |
| GET /search/instances: contributors <> "Brown John"  | 45         | 392        | 307        | 670         | 85,25         | 0.000%        | 0,26088        | 9,38         | 0,13        |
| GET /search/instances: contributors all "Jon Brown"  | 45         | 325        | 244        | 1278        | 154,2         | 0.000%        | 0,26149        | 6,81         | 0,13        |
| GET /search/instances: contributors any "Jon Brown"  | 44         | 366        | 275        | 1587        | 196,22        | 0.000%        | 0,26099        | 7,95         | 0,13        |
| GET /search/instances: contributors == "Jon Brown"   | 44         | 317        | 233        | 1367        | 168,11        | 0.000%        | 0,26117        | 0,07         | 0,13        |
| GET /search/instances: contributors <> "Jon Brown"   | 44         | 447        | 315        | 2035        | 268,57        | 0.000%        | 0,26107        | 9,45         | 0,13        |
| <b>TOTAL</b>                                         | <b>448</b> | <b>403</b> | <b>233</b> | <b>3842</b> | <b>269,72</b> | <b>0.000%</b> | <b>2,46944</b> | <b>80,33</b> | <b>1,23</b> |



## Filter search

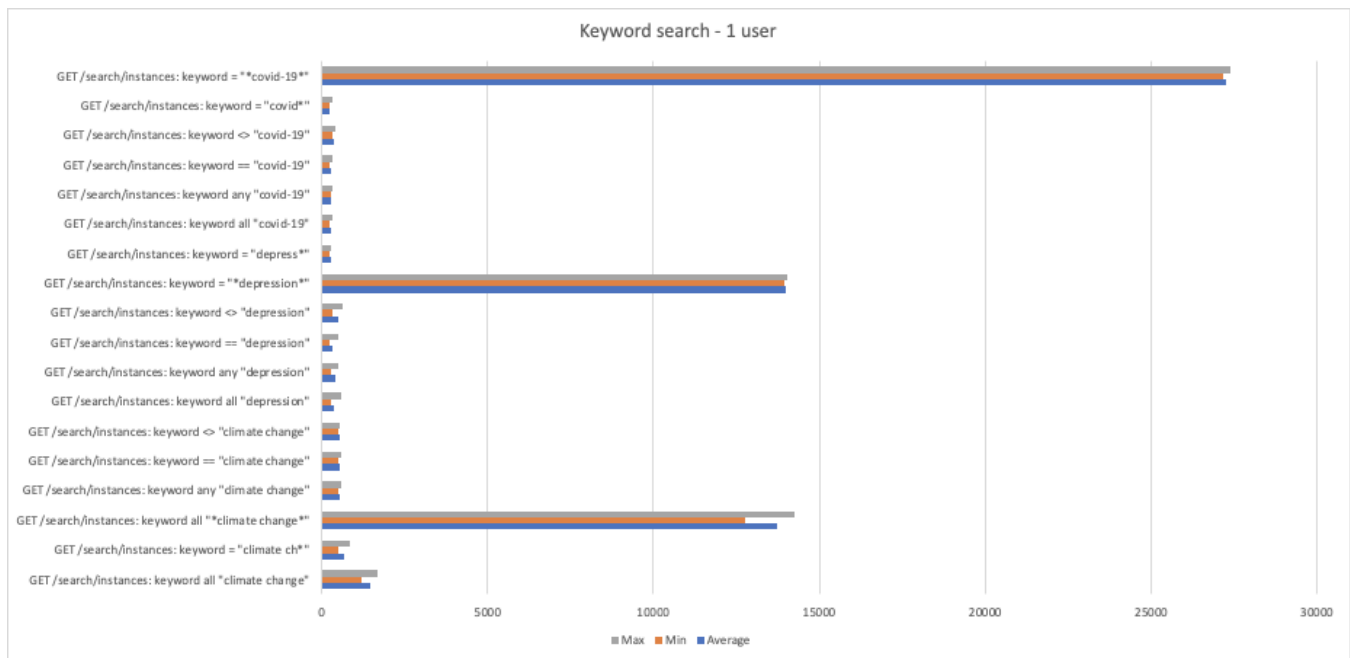
| Label                                                                                                       | Sampl<br>es | Avera<br>ge | Min        | Max         | Std.<br>Dev.  | Error<br>%    | Throughp<br>ut | Received KB<br>/sec | Sent KB<br>/sec |
|-------------------------------------------------------------------------------------------------------------|-------------|-------------|------------|-------------|---------------|---------------|----------------|---------------------|-----------------|
| GET /search/instances: languages == "eng"                                                                   | 88          | 401         | 267        | 1707        | 242,67        | 0.000%        | 0,48859        | 17,41               | 0,24            |
| GET /search/instances: languages == ("eng" OR "fre" OR "ita" OR "ukr")                                      | 87          | 456         | 297        | 4217        | 464,6         | 0.000%        | 0,49096        | 17,4                | 0,26            |
| GET /search/instances: languages == "eng" AND items.status.name == "Available"                              | 87          | 467         | 345        | 2536        | 246,12        | 0.000%        | 0,50185        | 17,91               | 0,27            |
| GET /search/instances: languages == ("eng" OR "fre") AND items.status.name == ("Available" OR "In transit") | 87          | 405         | 312        | 712         | 99,9          | 0.000%        | 0,5028         | 18                  | 0,29            |
| GET /search/instances: keyword all "water in africa" AND languages == "eng"                                 | 87          | 326         | 263        | 1311        | 116,12        | 0.000%        | 0,50378        | 6,65                | 0,27            |
| <b>TOTAL</b>                                                                                                | <b>437</b>  | <b>413</b>  | <b>263</b> | <b>4217</b> | <b>274,28</b> | <b>0.000%</b> | <b>2,40985</b> | <b>74,93</b>        | <b>1,29</b>     |

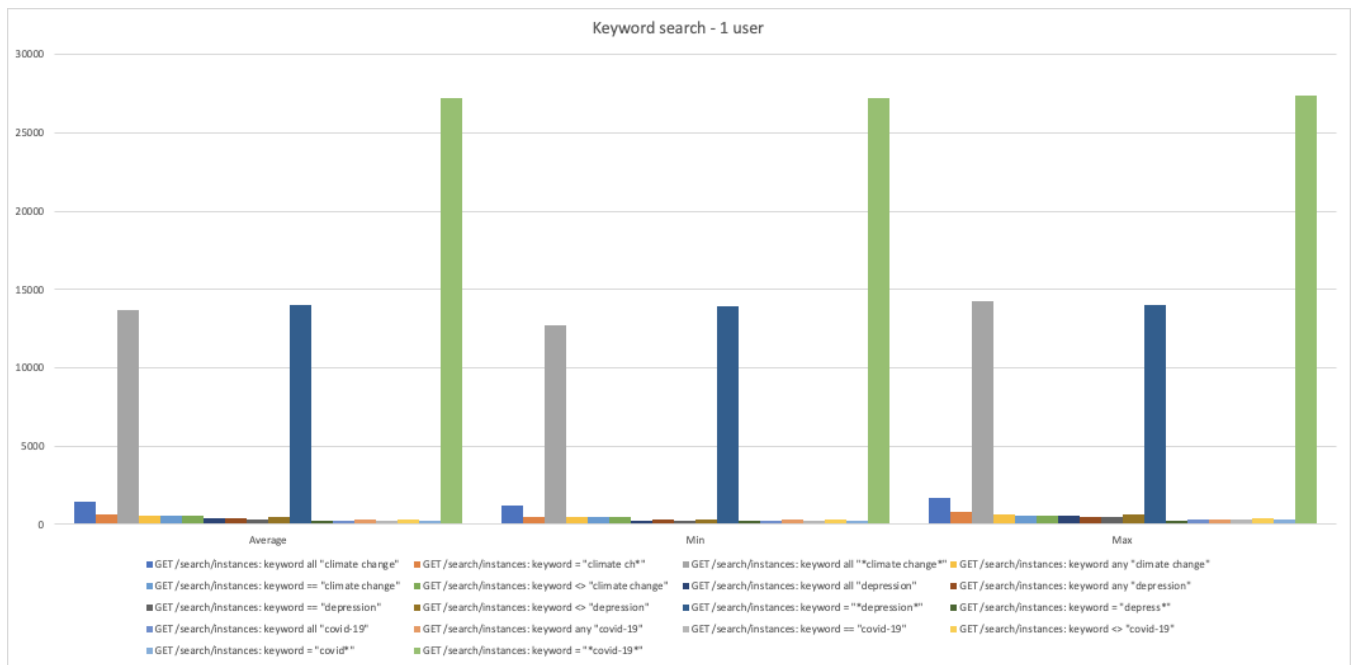


## Keyword search

| Label                                                 | Samples | Average | Min   | Max   | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|-------------------------------------------------------|---------|---------|-------|-------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: keyword all "climate change"   | 3       | 1470    | 1181  | 1702  | 216,48    | 0.000%  | 0,02417    | 0,77            | 0,01        |
| GET /search/instances: keyword = "climate ch"         | 3       | 676     | 488   | 834   | 142,84    | 0.000%  | 0,02434    | 0,99            | 0,01        |
| GET /search/instances: keyword all "'climate change'" | 3       | 13726   | 12745 | 14246 | 694,31    | 0.000%  | 0,02189    | 0,99            | 0,01        |
| GET /search/instances: keyword any "climate change"   | 3       | 544     | 509   | 610   | 46,7      | 0.000%  | 0,02402    | 0,87            | 0,01        |

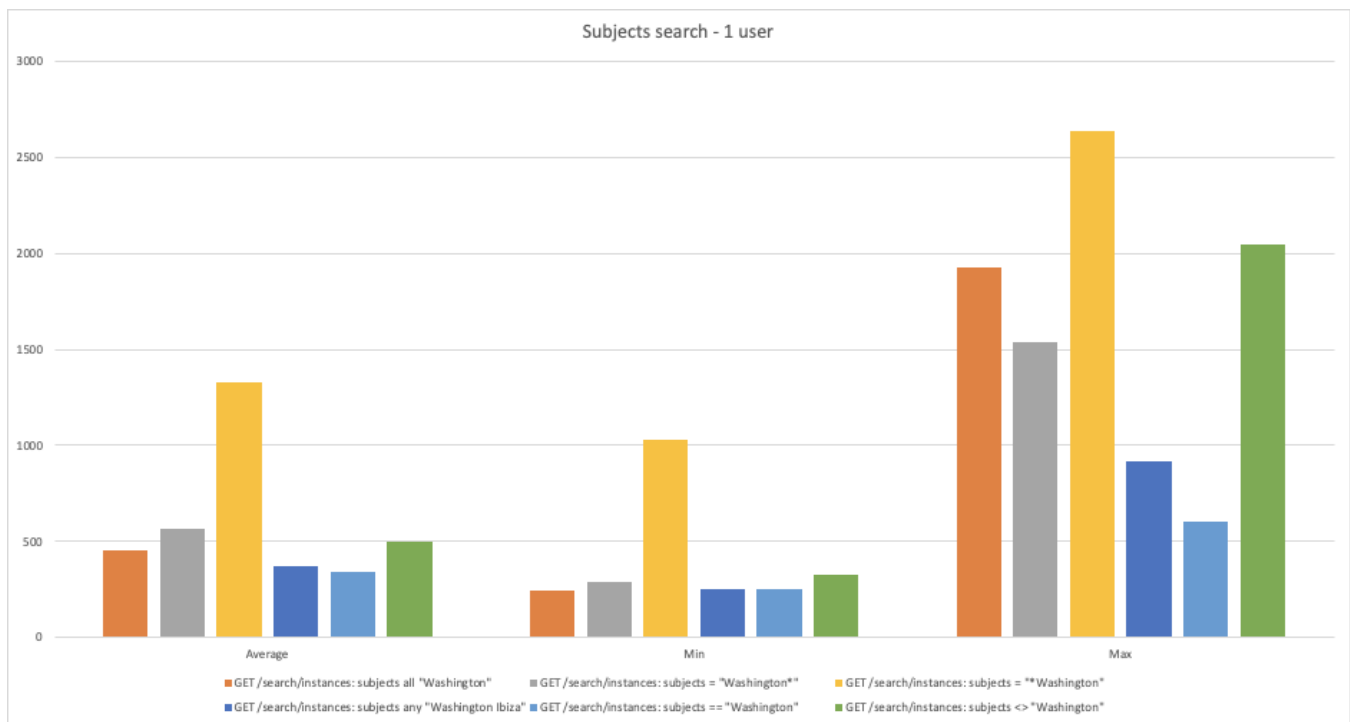
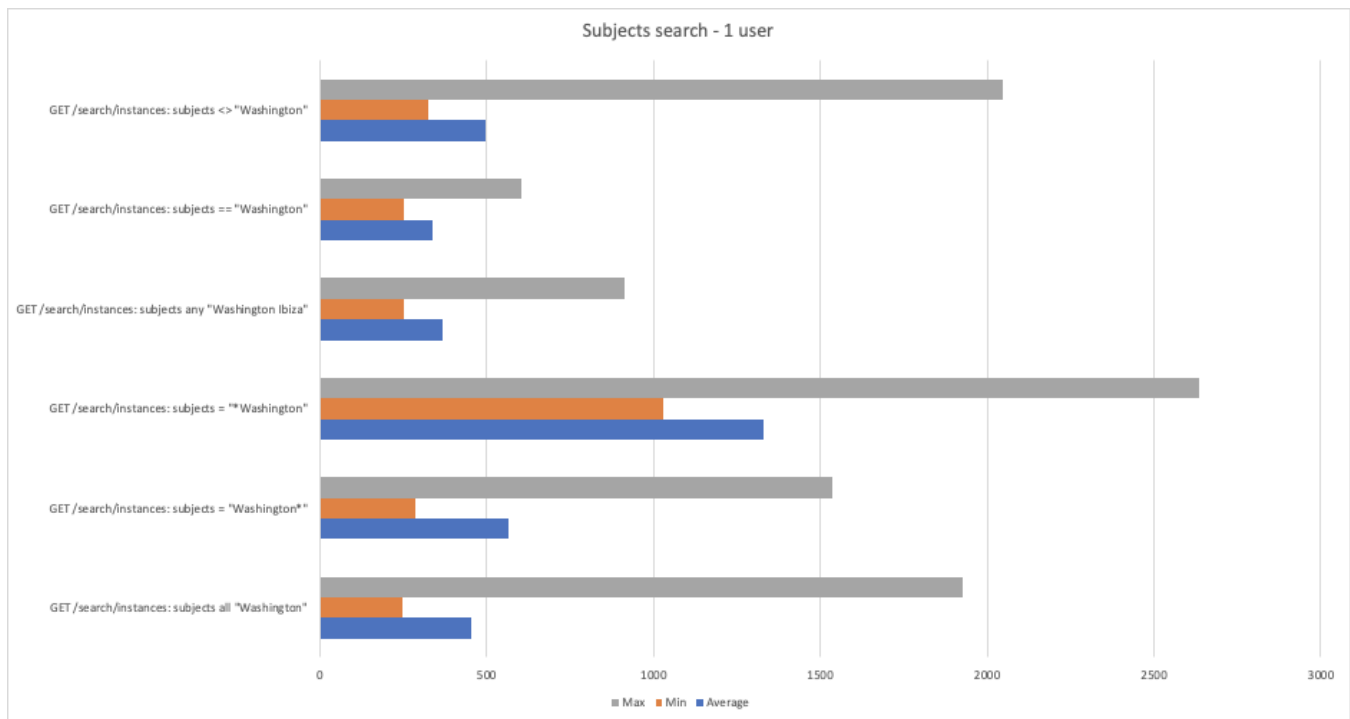
|                                                    |           |             |            |              |                |               |                |             |             |
|----------------------------------------------------|-----------|-------------|------------|--------------|----------------|---------------|----------------|-------------|-------------|
| GET /search/instances: keyword == "climate change" | 3         | 559         | 498        | 604          | 44,98          | 0.000%        | 0,02401        | 0,87        | 0,01        |
| GET /search/instances: keyword <= "climate change" | 3         | 528         | 517        | 535          | 8,06           | 0.000%        | 0,024          | 0,88        | 0,01        |
| GET /search/instances: keyword all "depression"    | 3         | 382         | 269        | 598          | 152,57         | 0.000%        | 0,02399        | 0,69        | 0,01        |
| GET /search/instances: keyword any "depression"    | 3         | 432         | 300        | 501          | 93,37          | 0.000%        | 0,02394        | 0,77        | 0,01        |
| GET /search/instances: keyword == "depression"     | 3         | 344         | 256        | 491          | 104,24         | 0.000%        | 0,02391        | 0,77        | 0,01        |
| GET /search/instances: keyword <= "depression"     | 3         | 497         | 325        | 625          | 126,36         | 0.000%        | 0,02384        | 0,84        | 0,01        |
| GET /search/instances: keyword = "**depression**"  | 3         | 13979       | 13950      | 14032        | 37,12          | 0.000%        | 0,02149        | 0,96        | 0,01        |
| GET /search/instances: keyword = "depress**"       | 3         | 263         | 254        | 280          | 11,81          | 0.000%        | 0,02383        | 0,85        | 0,01        |
| GET /search/instances: keyword all "covid-19"      | 3         | 266         | 224        | 331          | 46,29          | 0.000%        | 0,02382        | 0,01        | 0,01        |
| GET /search/instances: keyword any "covid-19"      | 3         | 302         | 281        | 332          | 21,77          | 0.000%        | 0,0238         | 0,77        | 0,01        |
| GET /search/instances: keyword == "covid-19"       | 3         | 267         | 244        | 310          | 30,43          | 0.000%        | 0,02379        | 0,01        | 0,01        |
| GET /search/instances: keyword <= "covid-19"       | 3         | 351         | 318        | 410          | 41,61          | 0.000%        | 0,02376        | 0,84        | 0,01        |
| GET /search/instances: keyword = "covid**"         | 3         | 256         | 229        | 305          | 34,71          | 0.000%        | 0,02377        | 0,01        | 0,01        |
| GET /search/instances: keyword = "**covid-19**"    | 3         | 27249       | 27182      | 27378        | 90,79          | 0.000%        | 0,01959        | 0,01        | 0,01        |
| <b>TOTAL</b>                                       | <b>55</b> | <b>3408</b> | <b>224</b> | <b>27378</b> | <b>7080,79</b> | <b>0.000%</b> | <b>0,29318</b> | <b>8,06</b> | <b>0,14</b> |





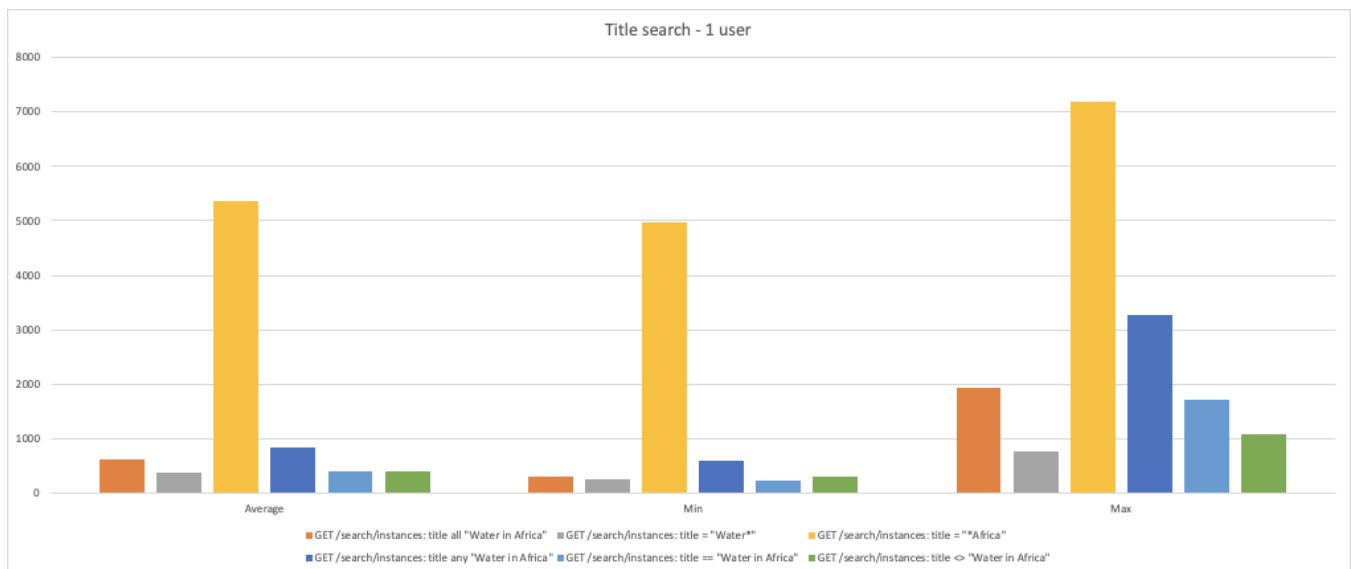
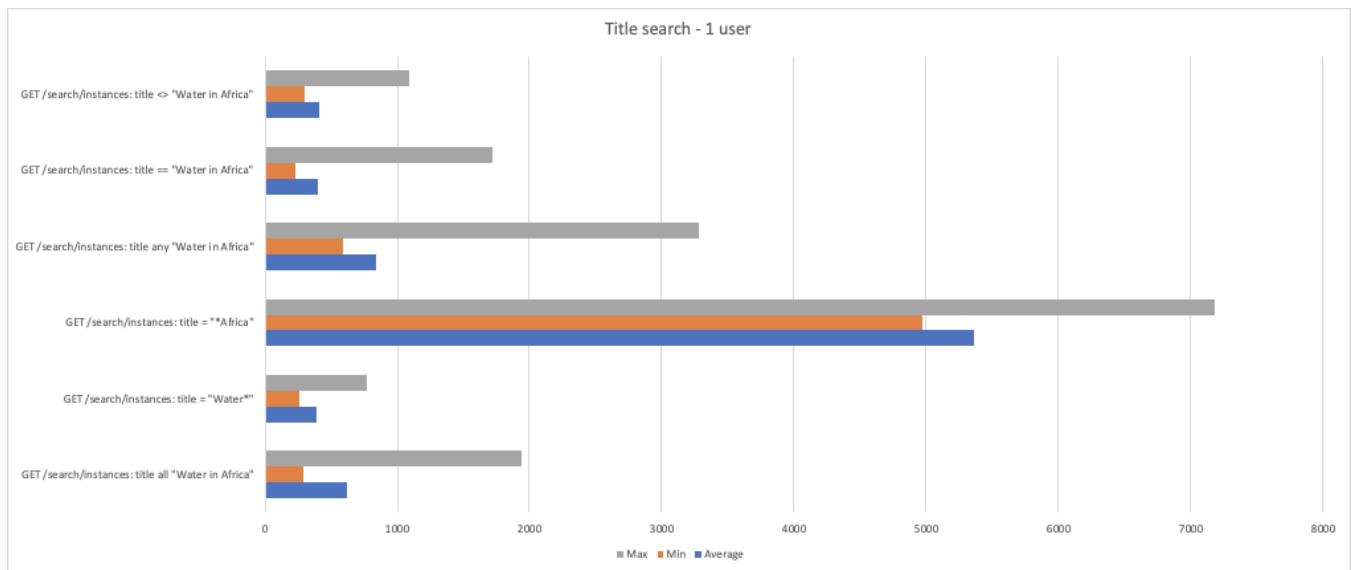
## Subjects search

| Label                                                  | Samples    | Average    | Min        | Max         | Std. Dev.     | Error %       | Throughput     | Received KB/sec | Sent KB/sec |
|--------------------------------------------------------|------------|------------|------------|-------------|---------------|---------------|----------------|-----------------|-------------|
| GET /search/instances: subjects all "Washington"       | 51         | 455        | 247        | 1927        | 381,68        | 0.000%        | 0,28489        | 9,43            | 0,14        |
| GET /search/instances: subjects = "Washington"         | 51         | 567        | 288        | 1536        | 247,46        | 0.000%        | 0,28665        | 12,05           | 0,14        |
| GET /search/instances: subjects = "*"Washington"       | 51         | 1331       | 1028       | 2635        | 323,5         | 0.000%        | 0,28582        | 12,04           | 0,14        |
| GET /search/instances: subjects any "Washington Ibiza" | 50         | 369        | 251        | 914         | 152,02        | 0.000%        | 0,28861        | 9,49            | 0,14        |
| GET /search/instances: subjects == "Washington"        | 50         | 340        | 253        | 606         | 100,18        | 0.000%        | 0,28938        | 9,59            | 0,14        |
| GET /search/instances: subjects <> "Washington"        | 50         | 498        | 324        | 2046        | 322,84        | 0.000%        | 0,2896         | 10,45           | 0,14        |
| <b>TOTAL</b>                                           | <b>304</b> | <b>597</b> | <b>247</b> | <b>2635</b> | <b>437,13</b> | <b>0.000%</b> | <b>1,66925</b> | <b>60,88</b>    | <b>0,83</b> |



## Title search

| Label                                              | Samples    | Average     | Min        | Max         | Std. Dev.      | Error %       | Throughput     | Received KB/sec | Sent KB/sec |
|----------------------------------------------------|------------|-------------|------------|-------------|----------------|---------------|----------------|-----------------|-------------|
| GET /search/instances: title all "Water in Africa" | 23         | 621         | 294        | 1938        | 327,77         | 0.000%        | 0,12933        | 7,4             | 0,06        |
| GET /search/instances: title = "Water"             | 23         | 388         | 264        | 770         | 124,32         | 0.000%        | 0,13053        | 5,5             | 0,06        |
| GET /search/instances: title = ""Africa"           | 23         | 5362        | 4973       | 7186        | 458,64         | 0.000%        | 0,12723        | 3,42            | 0,06        |
| GET /search/instances: title any "Water in Africa" | 22         | 841         | 588        | 3281        | 648,02         | 0.000%        | 0,13032        | 4,18            | 0,06        |
| GET /search/instances: title == "Water in Africa"  | 22         | 404         | 230        | 1718        | 336,58         | 0.000%        | 0,13053        | 0,29            | 0,07        |
| GET /search/instances: title <> "Water in Africa"  | 22         | 411         | 296        | 1089        | 181,8          | 0.000%        | 0,13051        | 4,71            | 0,07        |
| <b>TOTAL</b>                                       | <b>136</b> | <b>1356</b> | <b>230</b> | <b>7186</b> | <b>1856,46</b> | <b>0.000%</b> | <b>0,73676</b> | <b>24,11</b>    | <b>0,36</b> |



## Performance test results for 1 user

On average, search results fall between **200 and 500 ms**. Exceptions are requests in which a wildcard is present at the beginning or in the middle of the search request. There are **no errors** for all kinds of the search requests.

| Type of search  | Average response time in ms | Errors |
|-----------------|-----------------------------|--------|
| Regular         | 440                         | no     |
| Wildcard        | 450                         | no     |
| Wildcard prefix | 10300                       | no     |

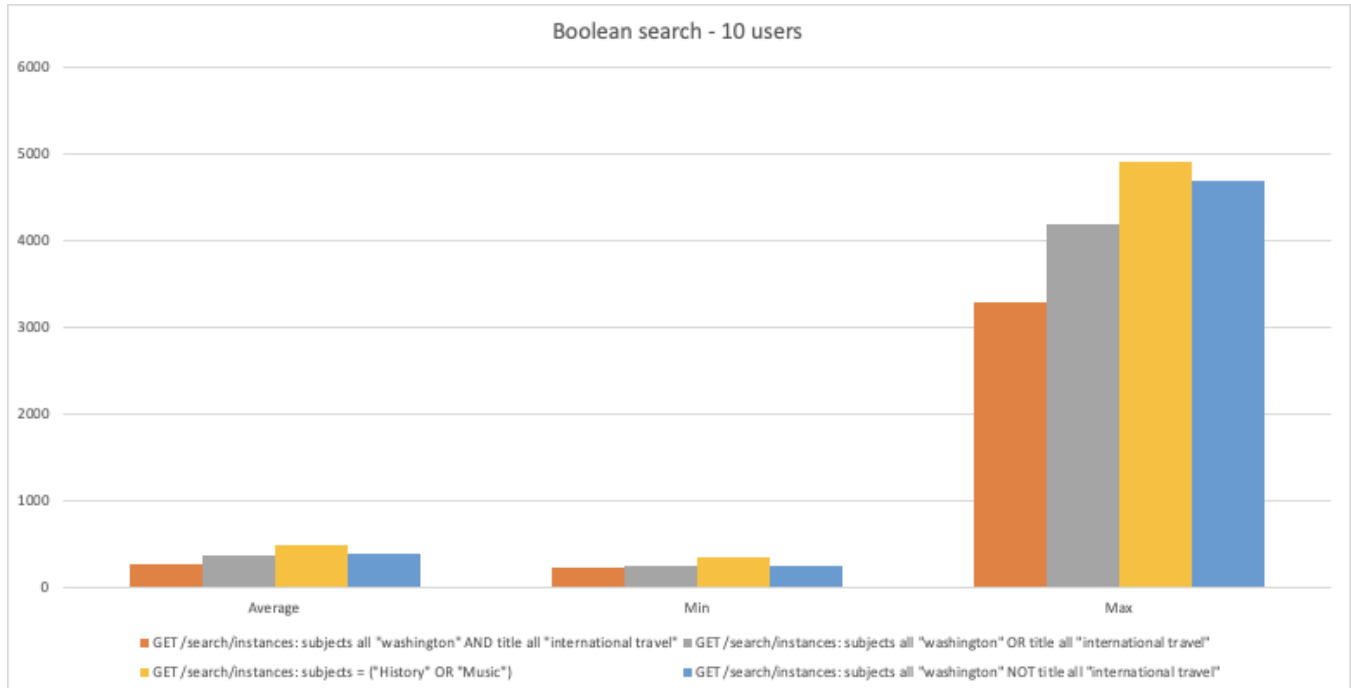
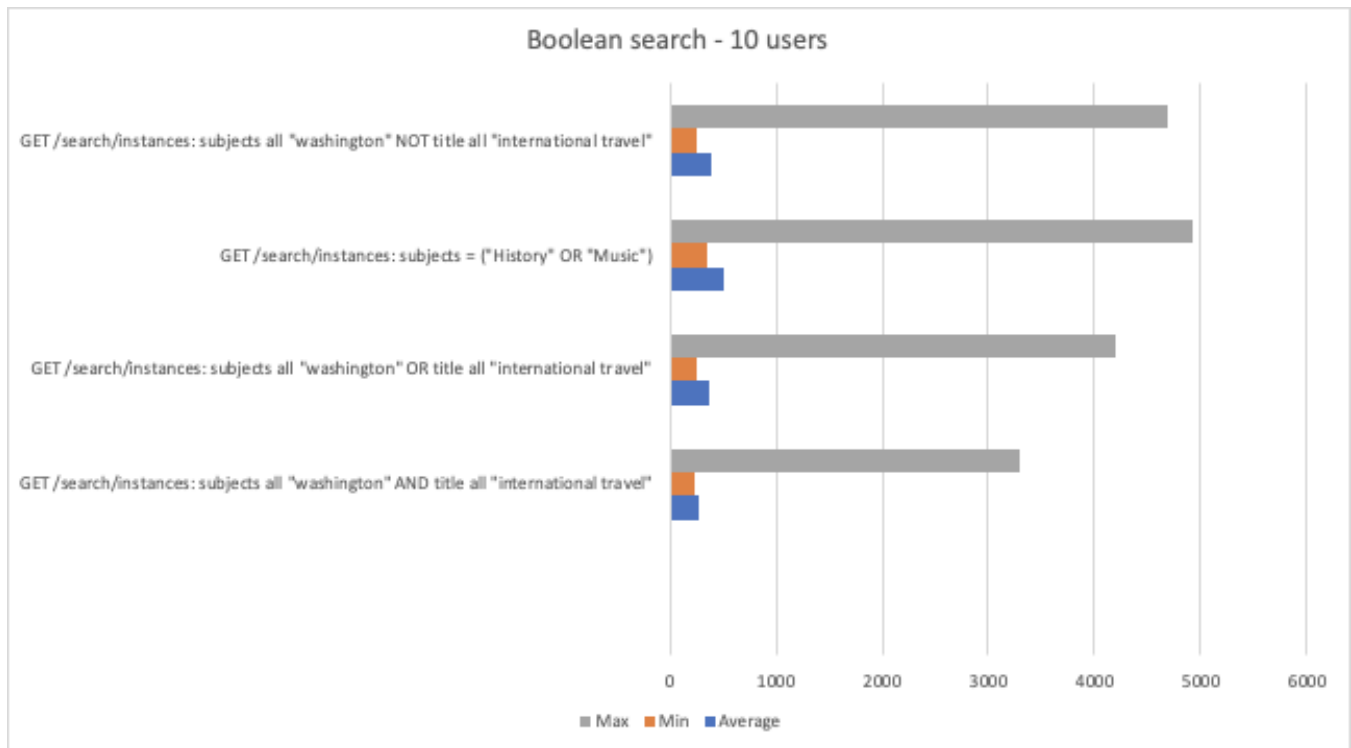
[1user\\_search\\_results.zip](#)

## Aggregated results for 10 users

### Boolean search

| Label                                                                                 | Samples | Average | Min | Max  | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|---------------------------------------------------------------------------------------|---------|---------|-----|------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: subjects all "washington" AND title all "international travel" | 1158    | 263     | 225 | 3301 | 124,24    | 0.000%  | 6,42662    | 13,86           | 3,45        |

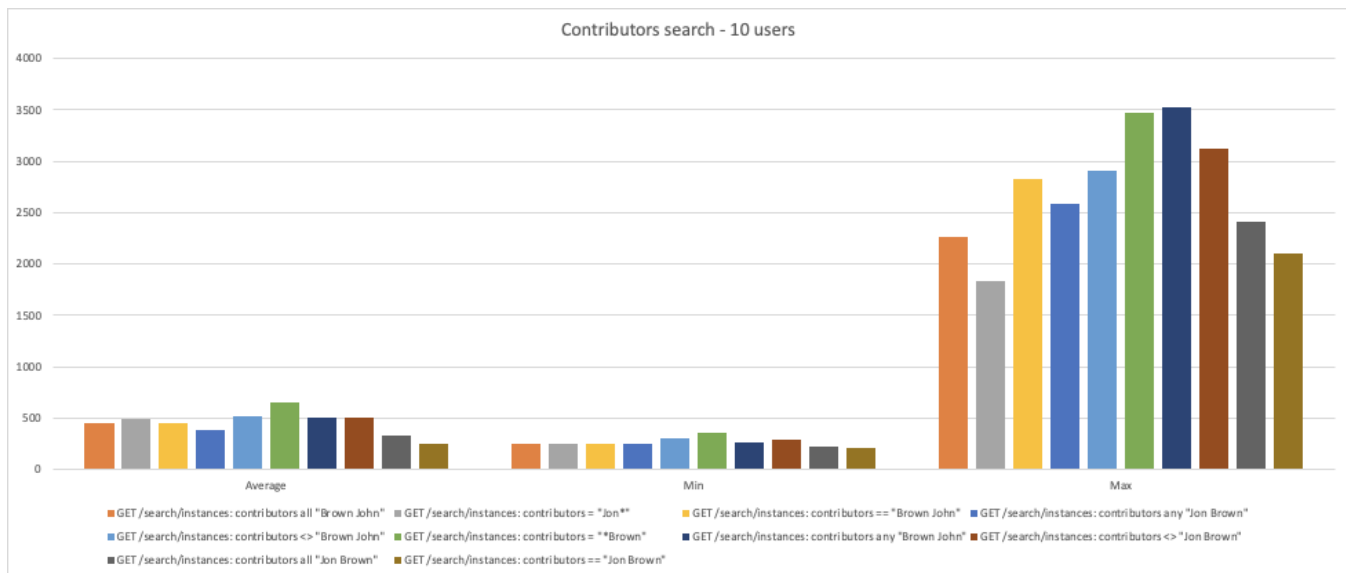
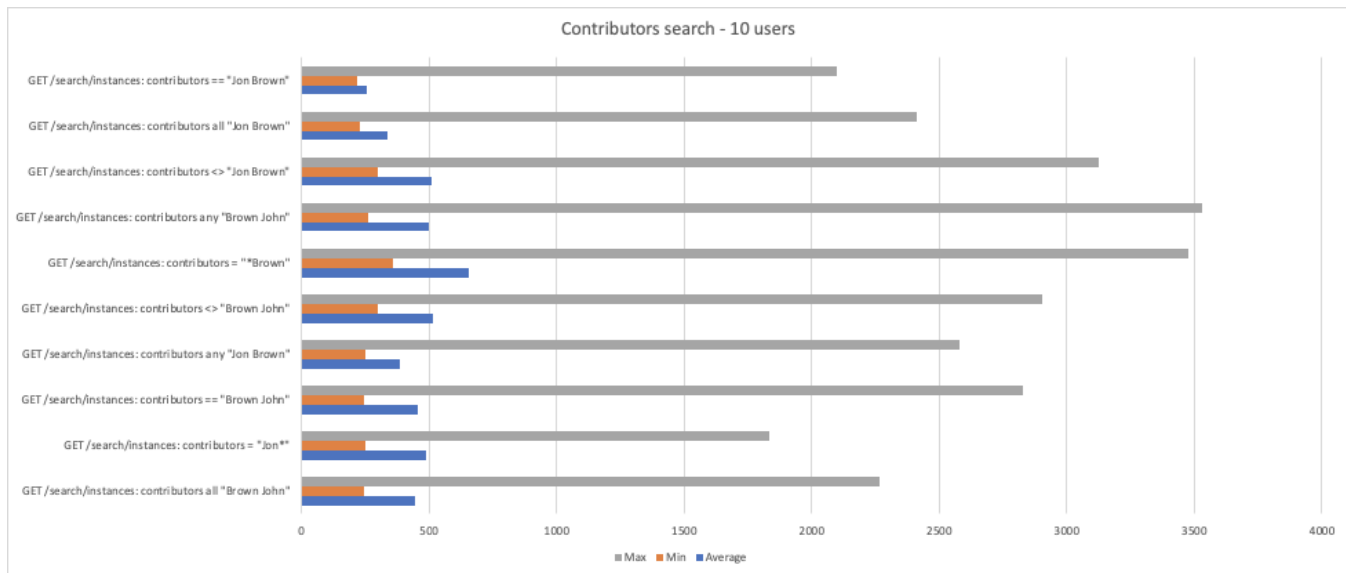
|                                                                                       |             |            |            |             |               |               |                 |               |              |
|---------------------------------------------------------------------------------------|-------------|------------|------------|-------------|---------------|---------------|-----------------|---------------|--------------|
| GET /search/instances: subjects all "washington" OR title all "international travel"  | 1158        | 378        | 258        | 4193        | 214,36        | 0.000%        | 6,43788         | 217,43        | 3,45         |
| GET /search/instances: subjects = ("History" OR "Music")                              | 1157        | 499        | 356        | 4915        | 281,99        | 0.000%        | 6,44888         | 212,63        | 3,31         |
| GET /search/instances: subjects all "washington" NOT title all "international travel" | 1157        | 386        | 251        | 4684        | 255,58        | 0.000%        | 6,45359         | 213,65        | 3,46         |
| <b>TOTAL</b>                                                                          | <b>4631</b> | <b>382</b> | <b>225</b> | <b>4915</b> | <b>242,14</b> | <b>0.000%</b> | <b>25,49984</b> | <b>650,08</b> | <b>13,52</b> |



## Contributors search

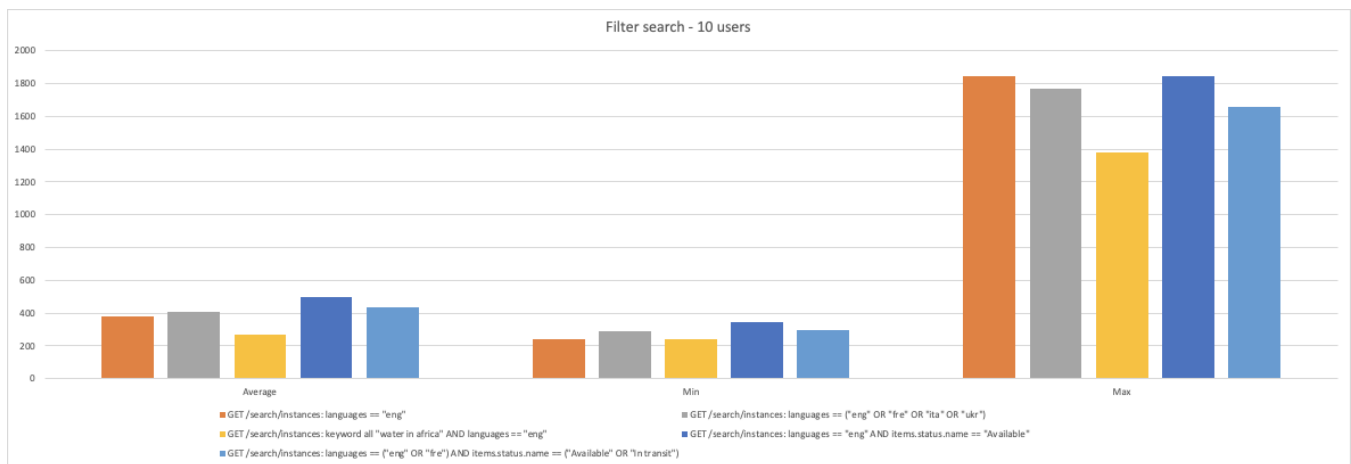
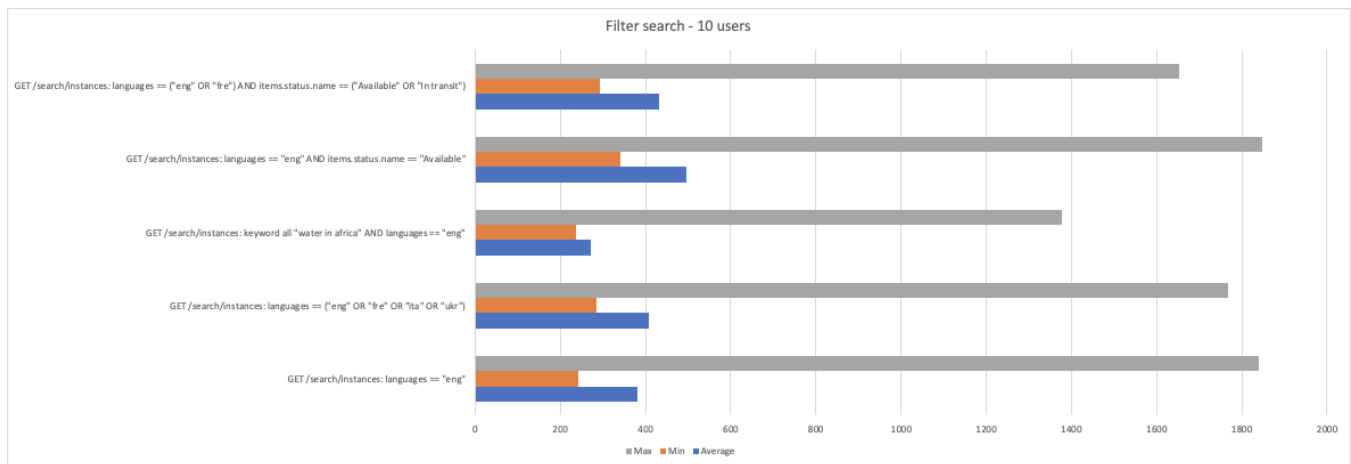
| Label                                                | Samples | Average | Min | Max  | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec | Avg. Bytes |
|------------------------------------------------------|---------|---------|-----|------|-----------|---------|------------|-----------------|-------------|------------|
| GET /search/instances: contributors all "Brown John" | 391     | 446     | 247 | 2268 | 293,56    | 0.000%  | 2,16879    | 83,29           | 1,08        | 39326,2    |
| GET /search/instances: contributors = "Jon"          | 391     | 487     | 248 | 1832 | 268,05    | 0.000%  | 2,17322    | 87,61           | 1,07        | 41278,8    |
| GET /search/instances: contributors == "Brown John"  | 391     | 458     | 247 | 2828 | 290,23    | 0.000%  | 2,18194    | 82,01           | 1,1         | 38489,8    |

|                                                      |             |            |            |             |               |               |                 |               |              |                |
|------------------------------------------------------|-------------|------------|------------|-------------|---------------|---------------|-----------------|---------------|--------------|----------------|
| GET /search/instances: contributors any "Jon Brown"  | 390         | 384        | 250        | 2579        | 298,58        | 0.000%        | 2,18805         | 66,61         | 1,09         | 31173,5        |
| GET /search/instances: contributors <> "Brown John"  | 390         | 515        | 299        | 2904        | 313,05        | 0.000%        | 2,18492         | 78,89         | 1,1          | 36974,9        |
| GET /search/instances: contributors = "**Brown"      | 391         | 656        | 356        | 3474        | 356,68        | 0.000%        | 2,17574         | 89,83         | 1,08         | 42275,9        |
| GET /search/instances: contributors any "Brown John" | 391         | 500        | 263        | 3531        | 347,49        | 0.000%        | 2,17835         | 83,68         | 1,09         | 39334,1        |
| GET /search/instances: contributors <> "Jon Brown"   | 390         | 509        | 296        | 3125        | 367,72        | 0.000%        | 2,18784         | 78,4          | 1,1          | 36692,6        |
| GET /search/instances: contributors all "Jon Brown"  | 390         | 335        | 229        | 2411        | 275,53        | 0.000%        | 2,18817         | 56,96         | 1,09         | 26655,9        |
| GET /search/instances: contributors == "Jon Brown"   | 390         | 256        | 215        | 2098        | 135,92        | 0.000%        | 2,19191         | 0,61          | 1,1          | 285,3          |
| <b>TOTAL</b>                                         | <b>3906</b> | <b>455</b> | <b>215</b> | <b>3531</b> | <b>318,99</b> | <b>0.000%</b> | <b>21,46118</b> | <b>696,84</b> | <b>10,73</b> | <b>33249,3</b> |



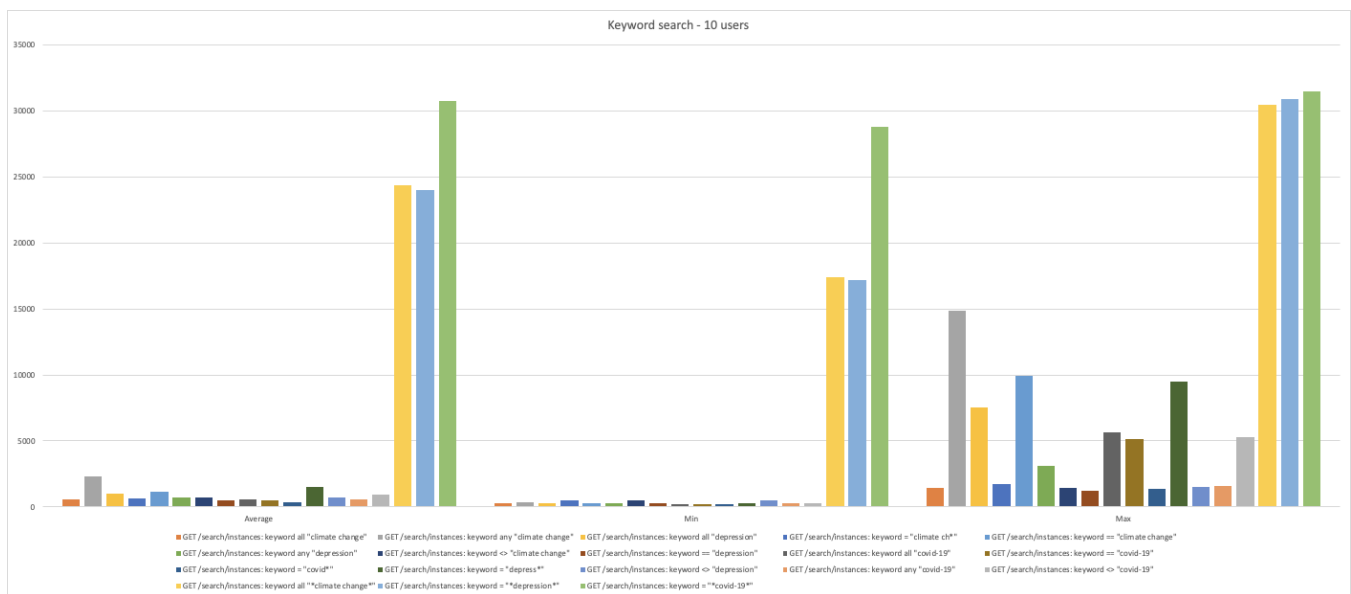
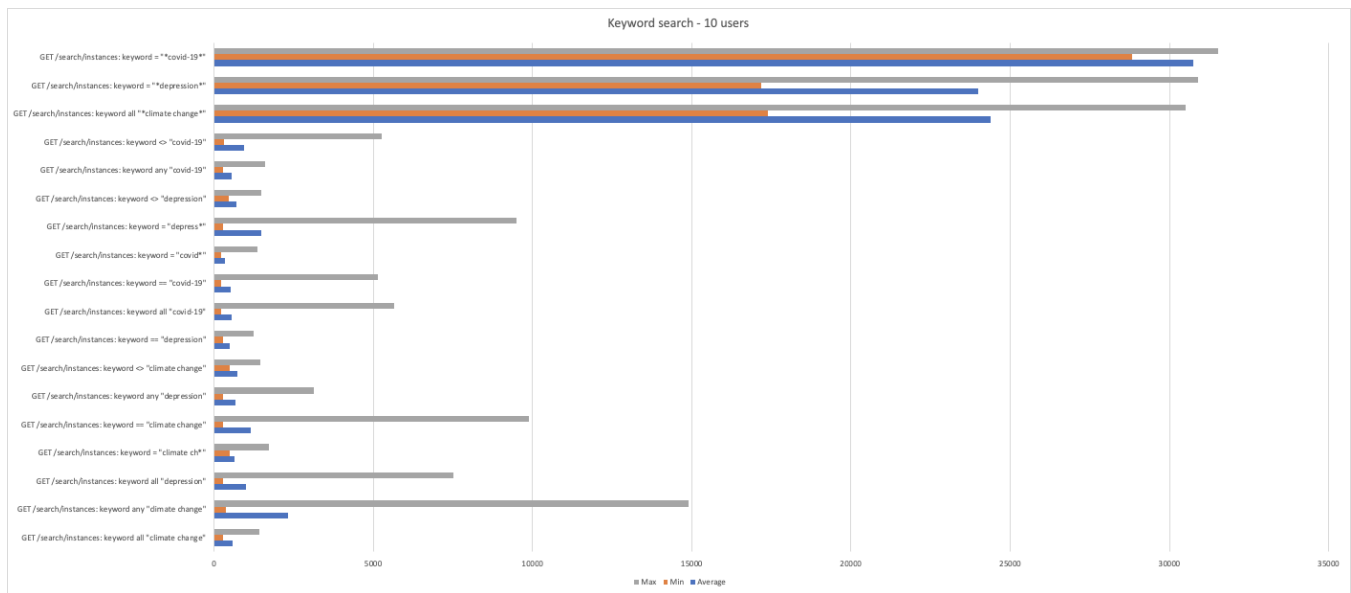
## Filter search

| Label                                                                                                       | Sampl<br>es | Avera<br>ge | Min        | Max         | Std.<br>Dev.  | Error<br>%    | Throughp<br>ut  | Received KB<br>/sec | Sent KB<br>/sec |
|-------------------------------------------------------------------------------------------------------------|-------------|-------------|------------|-------------|---------------|---------------|-----------------|---------------------|-----------------|
| GET /search/instances: languages == "eng"                                                                   | 898         | 381         | 243        | 1841        | 196,23        | 0.000%        | 4,96086         | 176,77              | 2,45            |
| GET /search/instances: languages == ("eng" OR "fre" OR "ita" OR "ukr")                                      | 898         | 408         | 286        | 1768        | 182,75        | 0.000%        | 4,96182         | 175,95              | 2,67            |
| GET /search/instances: keyword all "water in africa" AND languages == "eng"                                 | 897         | 271         | 238        | 1377        | 87,68         | 0.000%        | 4,99165         | 65,86               | 2,65            |
| GET /search/instances: languages == "eng" AND items.status.name == "Available"                              | 898         | 496         | 342        | 1847        | 219,04        | 0.000%        | 4,98537         | 178,1               | 2,68            |
| GET /search/instances: languages == ("eng" OR "fre") AND items.status.name == ("Available" OR "In transit") | 897         | 433         | 293        | 1654        | 207,47        | 0.000%        | 4,98627         | 178,22              | 2,9             |
| <b>TOTAL</b>                                                                                                | <b>4489</b> | <b>398</b>  | <b>238</b> | <b>1847</b> | <b>199,33</b> | <b>0.000%</b> | <b>24,61385</b> | <b>766,64</b>       | <b>13,19</b>    |



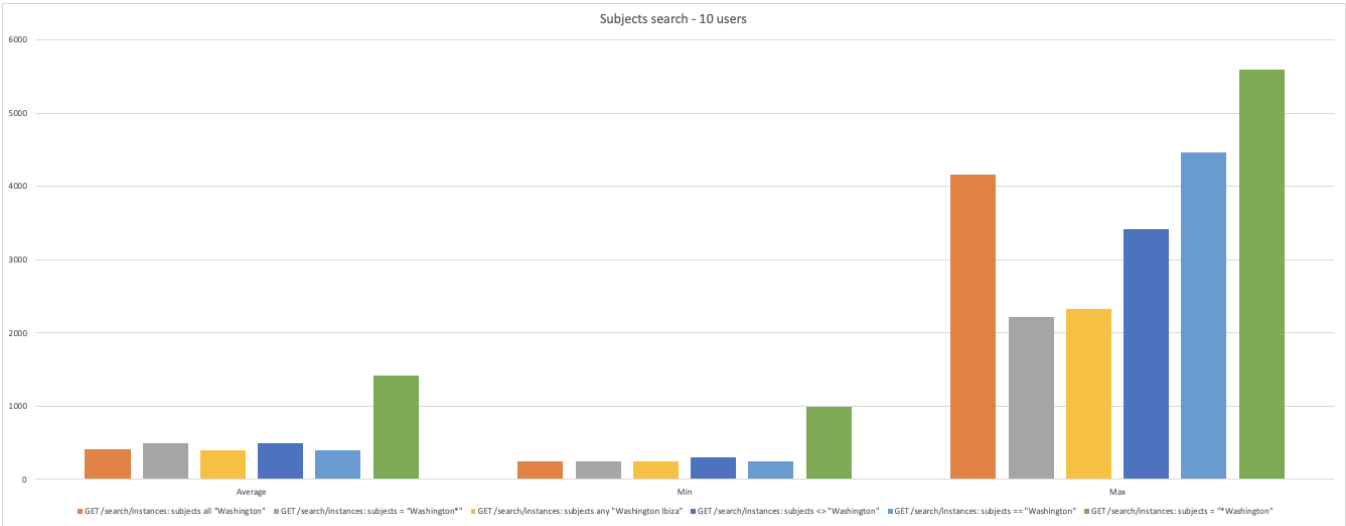
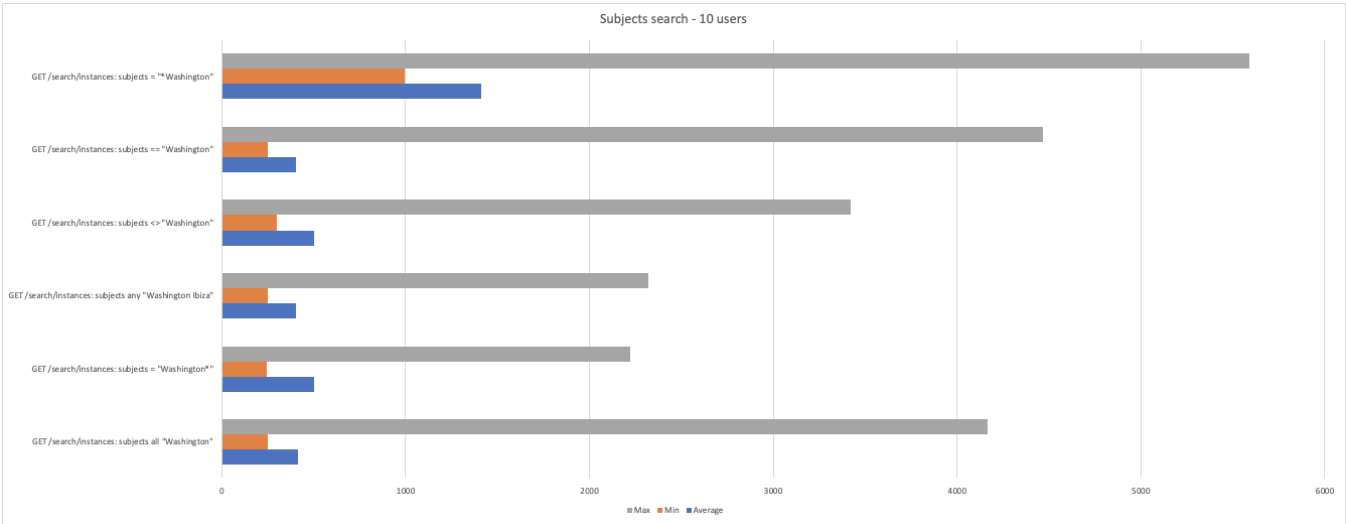
## Keyword search

| Label                                               | Samples | Average | Min   | Max   | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|-----------------------------------------------------|---------|---------|-------|-------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: keyword all "climate change" | 22      | 591     | 291   | 1430  | 331,38    | 0.000%  | 0,12216    | 3,87            | 0,06        |
| GET /search/instances: keyword any "climate change" | 21      | 2319    | 371   | 14889 | 3690,12   | 0.000%  | 0,11907    | 4,3             | 0,06        |
| GET /search/instances: keyword all "depression"     | 21      | 1014    | 273   | 7509  | 1576,33   | 0.000%  | 0,11887    | 3,44            | 0,06        |
| GET /search/instances: keyword = "climate ch"       | 21      | 658     | 481   | 1739  | 315,68    | 0.000%  | 0,11919    | 4,84            | 0,06        |
| GET /search/instances: keyword == "climate change"  | 21      | 1151    | 279   | 9904  | 2031,19   | 0.000%  | 0,11892    | 4,3             | 0,06        |
| GET /search/instances: keyword any "depression"     | 21      | 683     | 276   | 3141  | 645,98    | 0.000%  | 0,11876    | 3,81            | 0,06        |
| GET /search/instances: keyword <> "climate change"  | 21      | 722     | 498   | 1469  | 197,87    | 0.000%  | 0,11883    | 4,32            | 0,06        |
| GET /search/instances: keyword == "depression"      | 21      | 487     | 275   | 1237  | 233,82    | 0.000%  | 0,1188     | 3,81            | 0,06        |
| GET /search/instances: keyword all "covid-19"       | 21      | 561     | 220   | 5652  | 1149,8    | 0.000%  | 0,11876    | 0,03            | 0,06        |
| GET /search/instances: keyword == "covid-19"        | 21      | 523     | 231   | 5161  | 1047,23   | 0.000%  | 0,11845    | 0,03            | 0,06        |
| GET /search/instances: keyword = "covid"            | 21      | 354     | 228   | 1379  | 250,02    | 0.000%  | 0,11812    | 0,03            | 0,06        |
| GET /search/instances: keyword = "depress"          | 21      | 1490    | 277   | 9504  | 2326,28   | 0.000%  | 0,11889    | 4,27            | 0,06        |
| GET /search/instances: keyword <> "depression"      | 21      | 707     | 477   | 1496  | 206,18    | 0.000%  | 0,11852    | 4,31            | 0,06        |
| GET /search/instances: keyword any "covid-19"       | 21      | 546     | 289   | 1617  | 271,94    | 0.000%  | 0,11859    | 3,86            | 0,06        |
| GET /search/instances: keyword <> "covid-19"        | 21      | 948     | 301   | 5253  | 1006,42   | 0.000%  | 0,11809    | 4,27            | 0,06        |
| GET /search/instances: keyword all "climate change" | 21      | 24372   | 17391 | 30495 | 4202,38   | 9.524%  | 0,10865    | 4,43            | 0,05        |
| GET /search/instances: keyword = "depression"       | 21      | 23995   | 17195 | 30891 | 3993,28   | 4.762%  | 0,10566    | 4,5             | 0,05        |
| GET /search/instances: keyword = "covid-19"         | 21      | 30762   | 28823 | 31520 | 582,48    | 90.476% | 0,10168    | 0,05            | 0,05        |
| TOTAL                                               | 380     | 5082    | 220   | 31520 | 9769,26   | 5.789%  | 1,81064    | 50,15           | 0,9         |



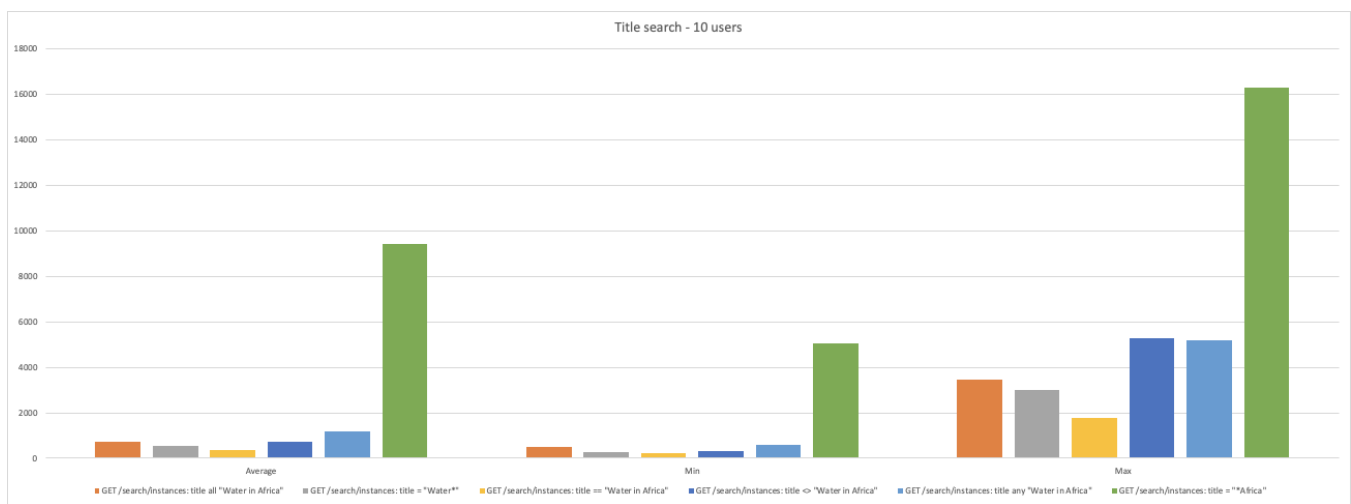
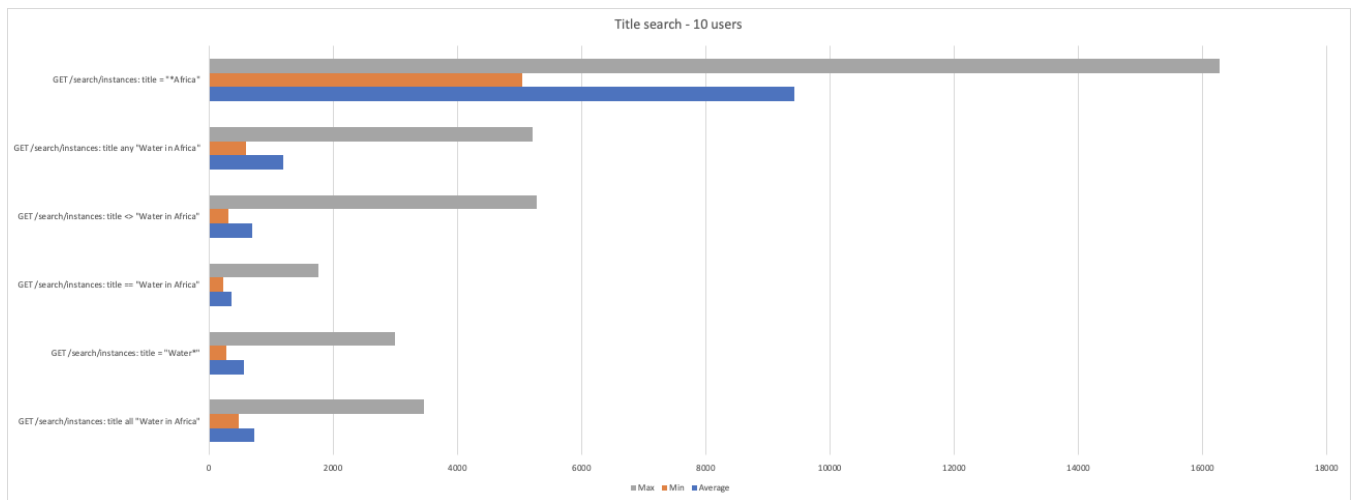
## Subjects search

| Label                                                  | Samples     | Average    | Min        | Max         | Std. Dev.     | Error %       | Throughput      | Received KB/sec | Sent KB/sec |
|--------------------------------------------------------|-------------|------------|------------|-------------|---------------|---------------|-----------------|-----------------|-------------|
| GET /search/instances: subjects all "Washington"       | 491         | 413        | 248        | 4168        | 316,54        | 0.000%        | 2,72416         | 90,18           | 1,35        |
| GET /search/instances: subjects = "Washington"         | 491         | 501        | 246        | 2223        | 228,14        | 0.000%        | 2,72676         | 114,77          | 1,36        |
| GET /search/instances: subjects any "Washington Ibiza" | 490         | 401        | 248        | 2323        | 284,27        | 0.000%        | 2,73921         | 90,07           | 1,37        |
| GET /search/instances: subjects <> "Washington"        | 490         | 501        | 299        | 3422        | 255,1         | 0.000%        | 2,73738         | 97,96           | 1,37        |
| GET /search/instances: subjects == "Washington"        | 490         | 401        | 248        | 4468        | 304,02        | 0.000%        | 2,73593         | 90,6            | 1,37        |
| GET /search/instances: subjects = "Washington"         | 490         | 1414       | 996        | 5592        | 320,4         | 0.000%        | 2,71246         | 114,27          | 1,35        |
| <b>TOTAL</b>                                           | <b>2943</b> | <b>605</b> | <b>246</b> | <b>5592</b> | <b>463,64</b> | <b>0.000%</b> | <b>16,10961</b> | <b>588,09</b>   | <b>8,03</b> |



### Title search

| Label                                              | Samples | Average | Min  | Max   | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|----------------------------------------------------|---------|---------|------|-------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: title all "Water in Africa" | 139     | 735     | 481  | 3468  | 389,12    | 0.000%  | 0,7718     | 44,15           | 0,38        |
| GET /search/instances: title = "Water"             | 139     | 561     | 287  | 3000  | 329,54    | 0.000%  | 0,7746     | 32,62           | 0,38        |
| GET /search/instances: title == "Water in Africa"  | 139     | 370     | 231  | 1763  | 294,21    | 0.000%  | 0,77862    | 1,72            | 0,39        |
| GET /search/instances: title <> "Water in Africa"  | 138     | 705     | 319  | 5279  | 535,11    | 0.000%  | 0,77641    | 27,93           | 0,39        |
| GET /search/instances: title any "Water in Africa" | 139     | 1202    | 603  | 5208  | 621,32    | 0.000%  | 0,77615    | 24,87           | 0,39        |
| GET /search/instances: title = ""Africa"           | 139     | 9424    | 5046 | 16280 | 2647,35   | 0.000%  | 0,75236    | 20,2            | 0,37        |
| TOTAL                                              | 834     | 2167    | 231  | 16280 | 3454,57   | 0.000%  | 4,45992    | 145,79          | 2,21        |



## Performance test results for 10 user

On average, search results fall between **300 and 600 ms**. Exceptions are requests in which a wildcard is present at the beginning or in the middle of the search request. There are **errors** for several kinds of the search requests.

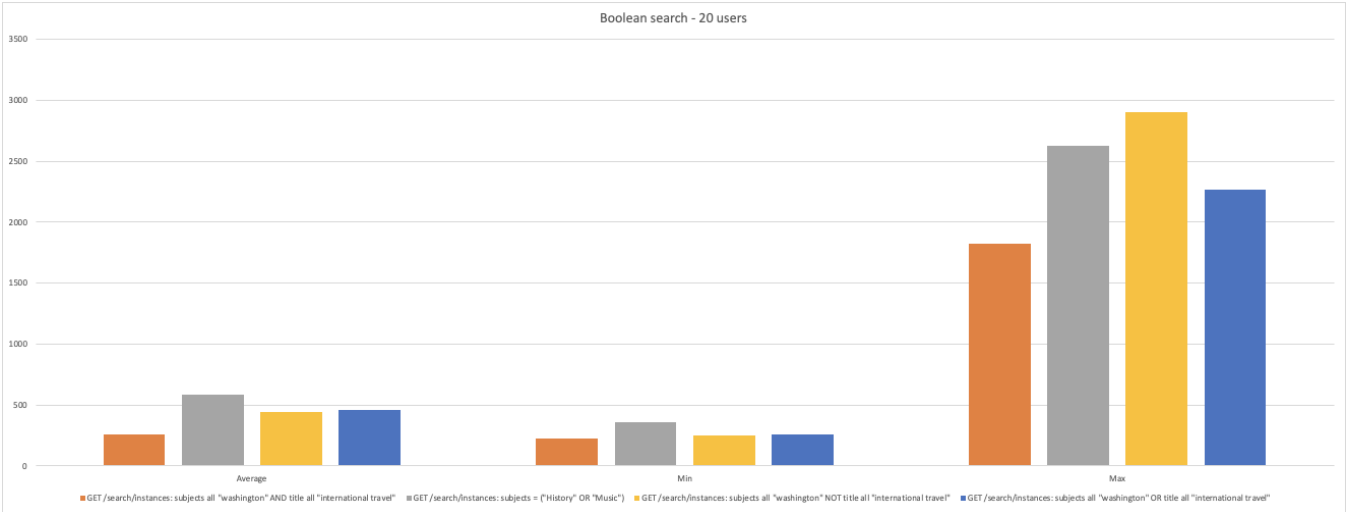
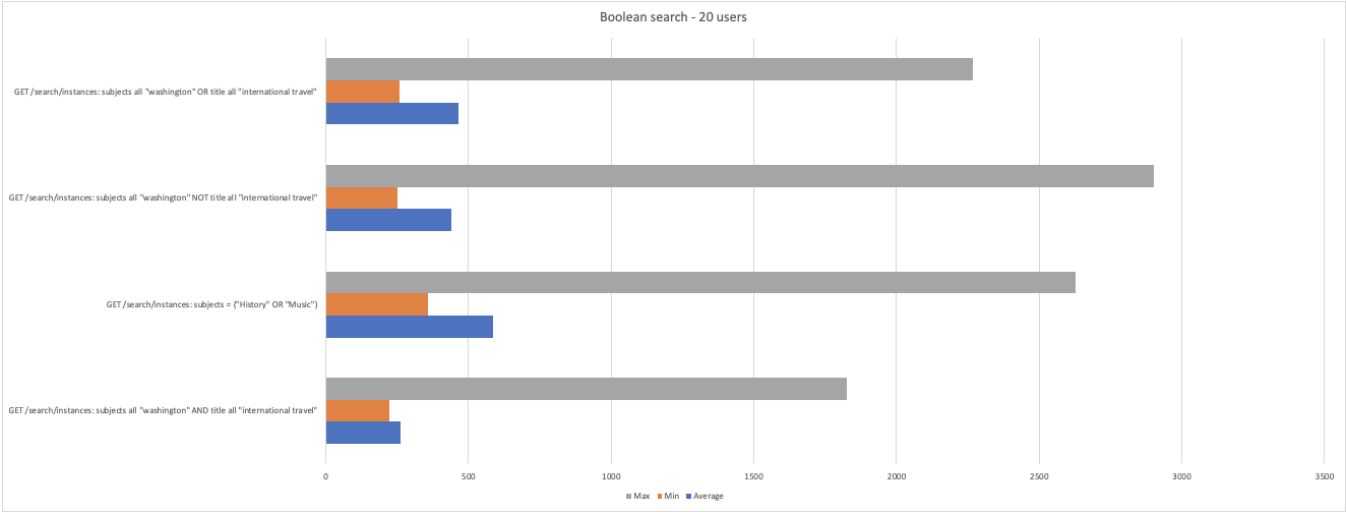
| Type of search  | Average response time in ms | Errors |
|-----------------|-----------------------------|--------|
| Regular         | 590                         | no     |
| Wildcard        | 675                         | no     |
| Wildcard prefix | 15100                       | yes    |

[10users\\_search\\_result.zip](#)

## Aggregated results for 20 users

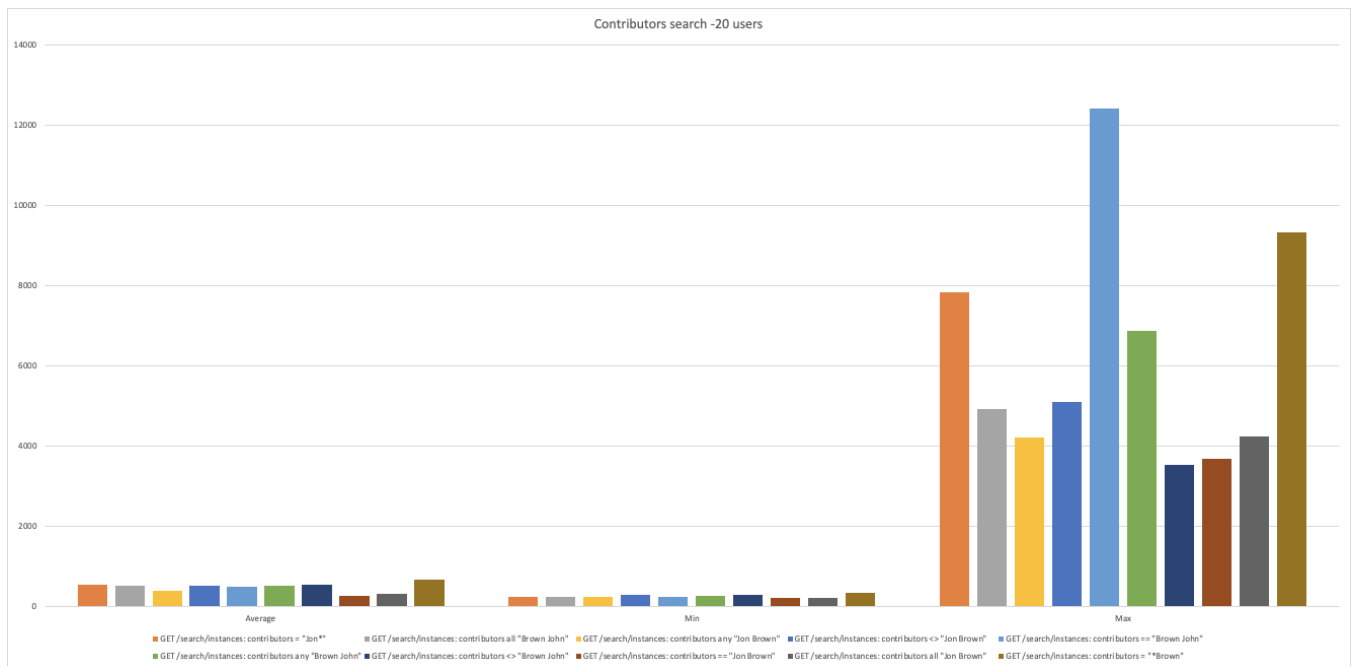
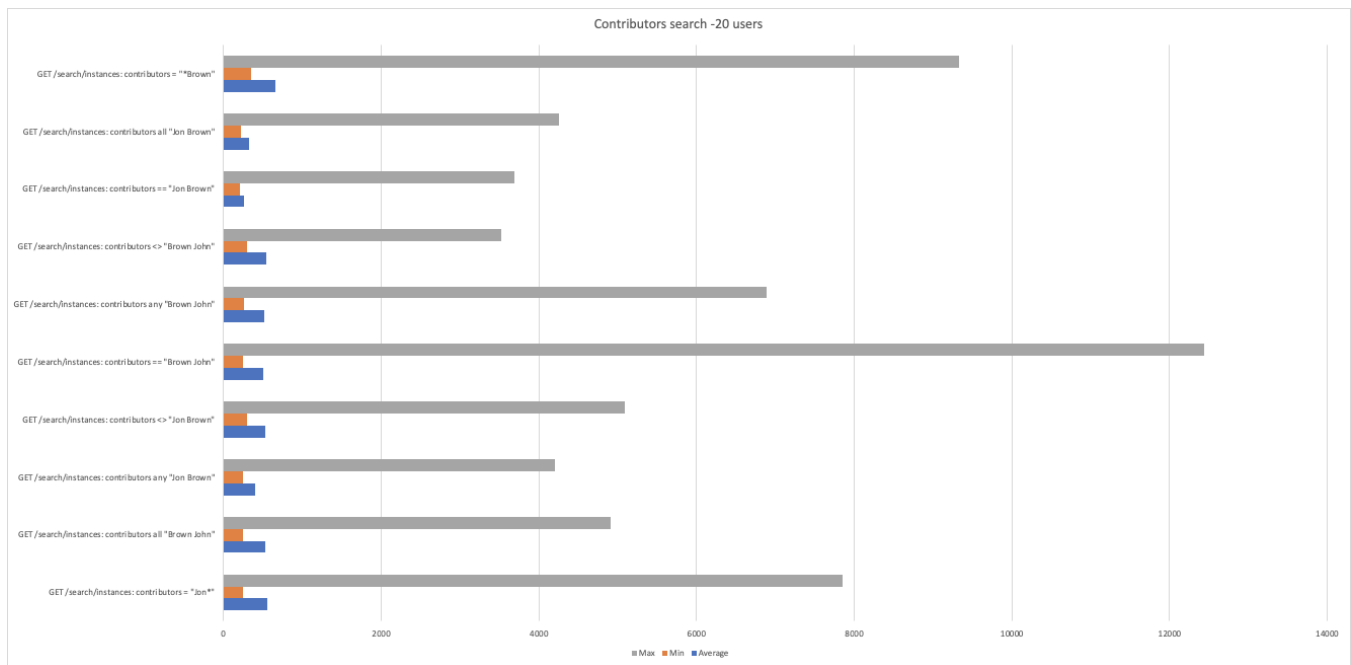
### Boolean search

| Label                                                                                 | Samples     | Average    | Min        | Max         | Std. Dev.     | Error %       | Throughput      | Received KB/sec | Sent KB/sec  |
|---------------------------------------------------------------------------------------|-------------|------------|------------|-------------|---------------|---------------|-----------------|-----------------|--------------|
| GET /search/instances: subjects all "washington" AND title all "international travel" | 2019        | 262        | 224        | 1824        | 96,59         | 0.000%        | 11,20154        | 24,16           | 6,01         |
| GET /search/instances: subjects = ("History" OR "Music")                              | 2018        | 585        | 357        | 2629        | 241,78        | 0.000%        | 11,21117        | 369,66          | 5,76         |
| GET /search/instances: subjects all "washington" NOT title all "international travel" | 2018        | 439        | 252        | 2903        | 229,62        | 0.000%        | 11,23202        | 371,88          | 6,02         |
| GET /search/instances: subjects all "washington" OR title all "international travel"  | 2018        | 463        | 257        | 2269        | 231,13        | 0.000%        | 11,19873        | 378,24          | 5,99         |
| <b>TOTAL</b>                                                                          | <b>8074</b> | <b>437</b> | <b>224</b> | <b>2903</b> | <b>238,59</b> | <b>0.000%</b> | <b>44,37849</b> | <b>1131,54</b>  | <b>23,53</b> |



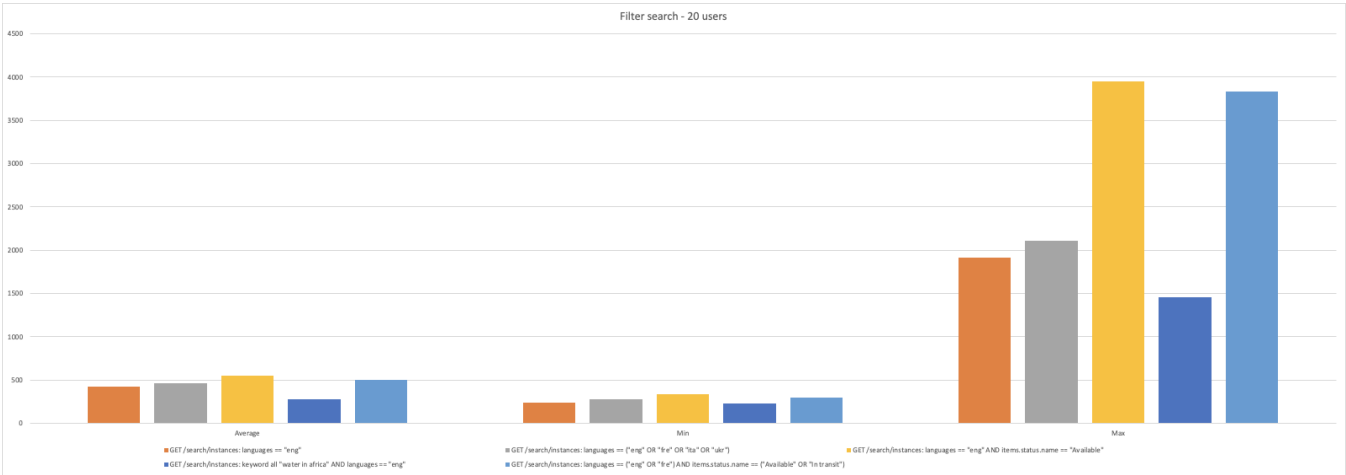
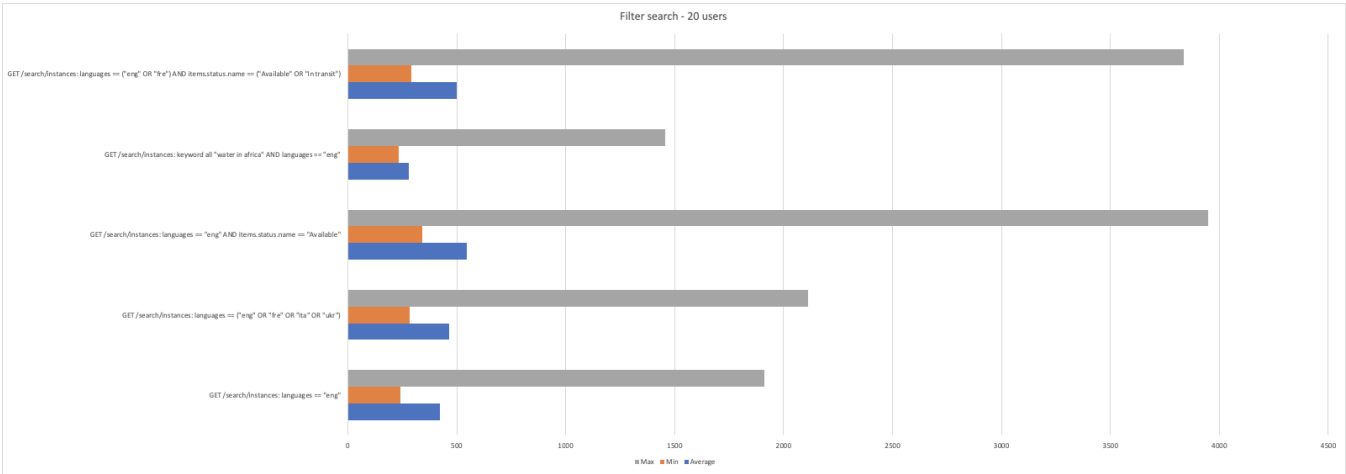
Contributors search

| Label                                                | Samples | Average | Min | Max   | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|------------------------------------------------------|---------|---------|-----|-------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: contributors = "Jon*"         | 731     | 553     | 246 | 7847  | 559,25    | 0.000%  | 4,05782    | 163,37          | 2,01        |
| GET /search/instances: contributors all "Brown John" | 731     | 533     | 246 | 4916  | 478,28    | 0.000%  | 4,05251    | 155,65          | 2,03        |
| GET /search/instances: contributors any "Jon Brown"  | 730     | 402     | 247 | 4208  | 356,63    | 0.000%  | 4,08687    | 124,41          | 2,04        |
| GET /search/instances: contributors <> "Jon Brown"   | 730     | 531     | 295 | 5094  | 373,32    | 0.000%  | 4,08998    | 146,73          | 2,05        |
| GET /search/instances: contributors == "Brown John"  | 730     | 503     | 248 | 12432 | 599,02    | 0.000%  | 4,07619    | 153,23          | 2,05        |
| GET /search/instances: contributors any "Brown John" | 730     | 518     | 261 | 6884  | 431,21    | 0.000%  | 4,06878    | 156,29          | 2,03        |
| GET /search/instances: contributors <> "Brown John"  | 730     | 544     | 298 | 3524  | 369,2     | 0.000%  | 4,08581    | 147,01          | 2,05        |
| GET /search/instances: contributors == "Jon Brown"   | 730     | 257     | 215 | 3693  | 181,81    | 0.000%  | 4,09397    | 1,14            | 2,05        |
| GET /search/instances: contributors all "Jon Brown"  | 730     | 330     | 226 | 4254  | 322,05    | 0.000%  | 4,08737    | 106,41          | 2,04        |
| GET /search/instances: contributors = ""Brown"       | 730     | 662     | 356 | 9332  | 490       | 0.000%  | 4,05943    | 167,47          | 2,01        |
| TOTAL                                                | 7303    | 483     | 215 | 12432 | 446,64    | 0.000%  | 40,18798   | 1304,14         | 20,08       |



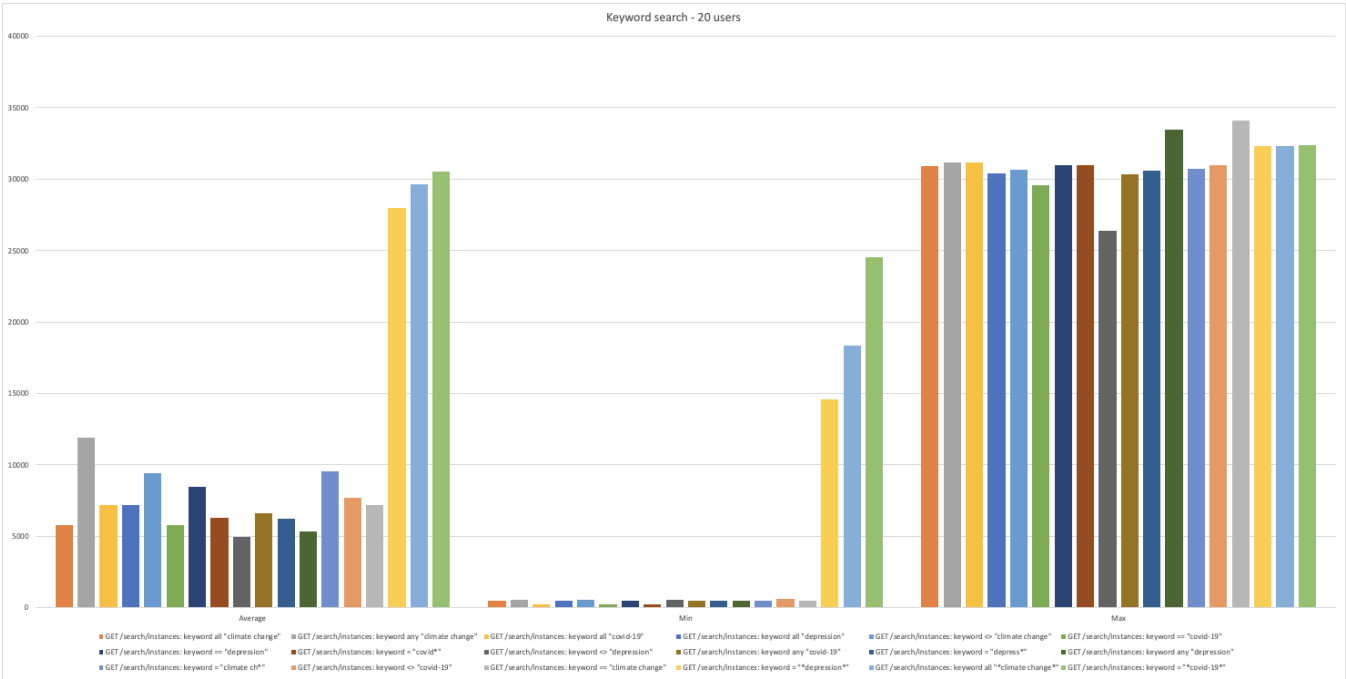
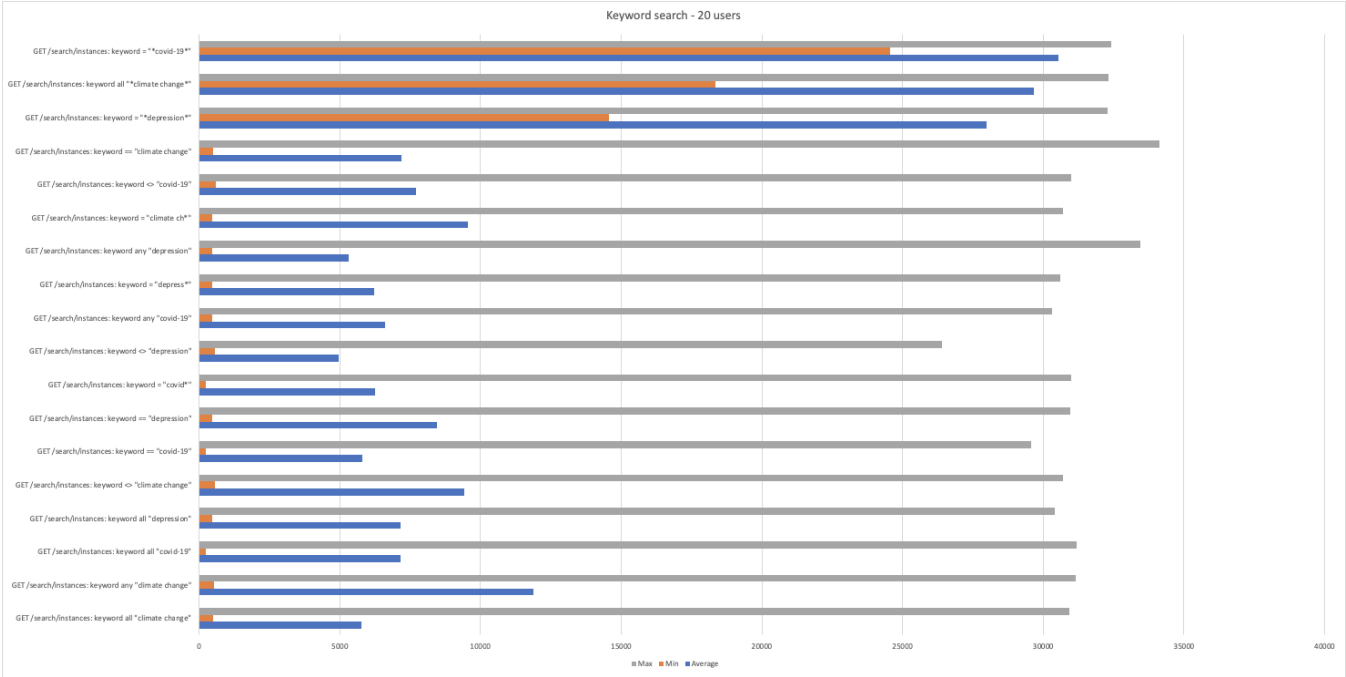
## Filter search

| Label                                                                                                       | Sampl<br>es | Avera<br>ge | Min        | Max         | Std.<br>Dev.  | Error<br>%    | Throughp<br>ut | Received KB<br>/sec | Sent KB<br>/sec |
|-------------------------------------------------------------------------------------------------------------|-------------|-------------|------------|-------------|---------------|---------------|----------------|---------------------|-----------------|
| GET /search/instances: languages == "eng"                                                                   | 1599        | 422         | 243        | 1910        | 212,22        | 0.000%        | 8,84227        | 315,09              | 4,36            |
| GET /search/instances: languages == ("eng" OR "fre" OR "ita" OR "ukr")                                      | 1599        | 467         | 283        | 2114        | 219,1         | 0.000%        | 8,87214        | 314,57              | 4,77            |
| GET /search/instances: languages == "eng" AND items.status.name == "Available"                              | 1599        | 548         | 341        | 3949        | 227,8         | 0.000%        | 8,85652        | 316,44              | 4,76            |
| GET /search/instances: keyword all "water in africa" AND languages == "eng"                                 | 1599        | 279         | 234        | 1458        | 114,23        | 0.000%        | 8,89317        | 117,33              | 4,72            |
| GET /search/instances: languages == ("eng" OR "fre") AND items.status.name == ("Available" OR "In transit") | 1599        | 499         | 293        | 3837        | 263,64        | 0.000%        | 8,89846        | 318,13              | 5,17            |
| <b>TOTAL</b>                                                                                                | <b>7996</b> | <b>443</b>  | <b>234</b> | <b>3949</b> | <b>232,23</b> | <b>0.000%</b> | <b>43,8803</b> | <b>1366,85</b>      | <b>23,51</b>    |



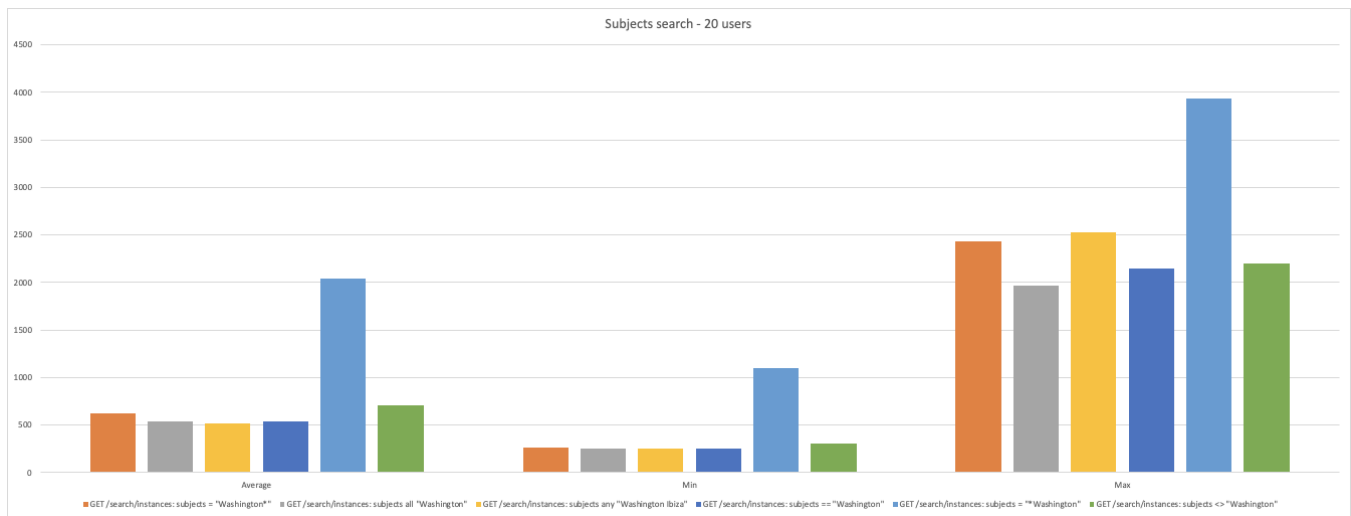
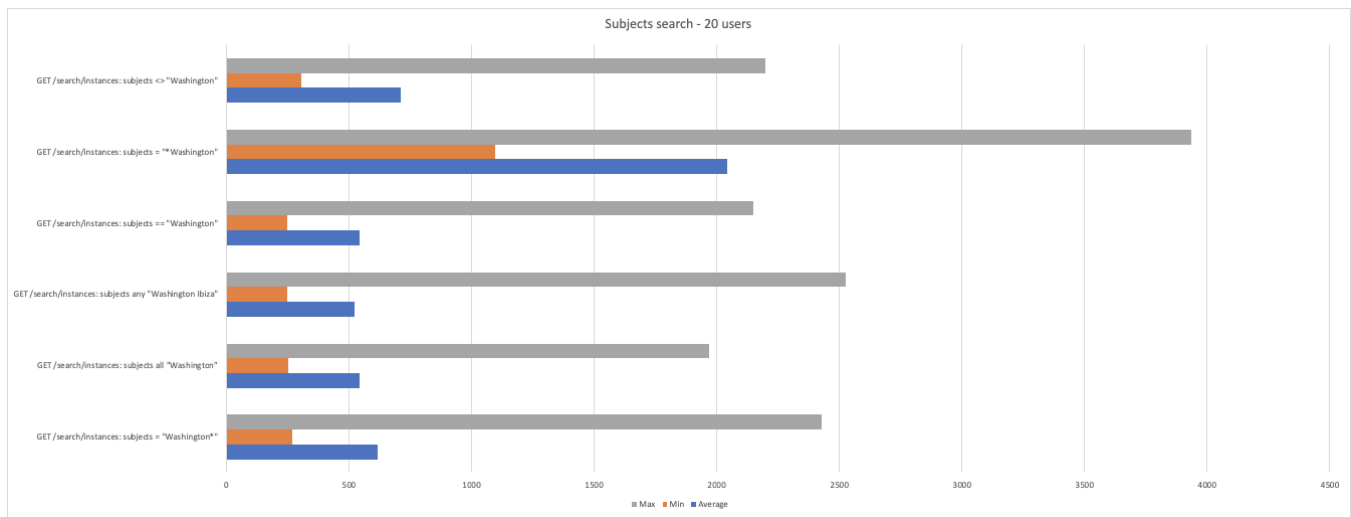
## Keyword search

| Label                                                 | Samples    | Average      | Min        | Max          | Std. Dev.       | Error %        | Throughput     | Received KB/sec | Sent KB/sec |
|-------------------------------------------------------|------------|--------------|------------|--------------|-----------------|----------------|----------------|-----------------|-------------|
| GET /search/instances: keyword all "climate change"   | 19         | 5765         | 510        | 30918        | 10553,78        | 5.263%         | 0,10479        | 3,15            | 0,05        |
| GET /search/instances: keyword any "climate change"   | 19         | 11879        | 528        | 31163        | 13093,89        | 5.263%         | 0,09979        | 3,42            | 0,05        |
| GET /search/instances: keyword all "covid-19"         | 19         | 7165         | 230        | 31170        | 11397,79        | 5.263%         | 0,10074        | 0,03            | 0,05        |
| GET /search/instances: keyword all "depression"       | 19         | 7176         | 478        | 30396        | 10783,25        | 0.000%         | 0,10056        | 2,91            | 0,05        |
| GET /search/instances: keyword <> "climate change"    | 19         | 9424         | 570        | 30689        | 10999,67        | 0.000%         | 0,10034        | 3,57            | 0,05        |
| GET /search/instances: keyword == "covid-19"          | 19         | 5790         | 226        | 29580        | 10096,7         | 0.000%         | 0,11651        | 0,03            | 0,06        |
| GET /search/instances: keyword == "depression"        | 19         | 8461         | 466        | 30959        | 11910,88        | 5.263%         | 0,10021        | 3,04            | 0,05        |
| GET /search/instances: keyword = "covid"              | 19         | 6265         | 232        | 30980        | 10640,57        | 5.263%         | 0,10091        | 0,03            | 0,05        |
| GET /search/instances: keyword <> "depression"        | 19         | 4978         | 556        | 26400        | 8073,8          | 0.000%         | 0,10044        | 3,58            | 0,05        |
| GET /search/instances: keyword any "covid-19"         | 19         | 6605         | 469        | 30315        | 10247,49        | 0.000%         | 0,10064        | 3,28            | 0,05        |
| GET /search/instances: keyword = "depress"            | 19         | 6231         | 470        | 30607        | 10384,57        | 0.000%         | 0,1006         | 3,62            | 0,05        |
| GET /search/instances: keyword any "depression"       | 19         | 5329         | 471        | 33462        | 9448,08         | 0.000%         | 0,1162         | 3,72            | 0,06        |
| GET /search/instances: keyword = "climate ch"         | 19         | 9550         | 476        | 30712        | 12403,6         | 5.263%         | 0,11525        | 4,45            | 0,06        |
| GET /search/instances: keyword <> "covid-19"          | 19         | 7705         | 596        | 30984        | 11410,04        | 0.000%         | 0,10075        | 3,65            | 0,05        |
| GET /search/instances: keyword == "climate change"    | 19         | 7183         | 506        | 34121        | 10908,9         | 0.000%         | 0,11616        | 4,2             | 0,06        |
| GET /search/instances: keyword = ""depression""       | 19         | 27986        | 14576      | 32296        | 5025,92         | 57.895%        | 0,10096        | 1,94            | 0,05        |
| GET /search/instances: keyword all ""climate change"" | 19         | 29665        | 18336      | 32307        | 2966,47         | 52.632%        | 0,09824        | 2,12            | 0,05        |
| GET /search/instances: keyword = ""covid-19""         | 19         | 30543        | 24568      | 32404        | 1519,72         | 89.474%        | 0,0945         | 0,05            | 0,05        |
| <b>TOTAL</b>                                          | <b>343</b> | <b>10954</b> | <b>226</b> | <b>34121</b> | <b>13087,04</b> | <b>12.828%</b> | <b>1,67625</b> | <b>41,66</b>    | <b>0,83</b> |



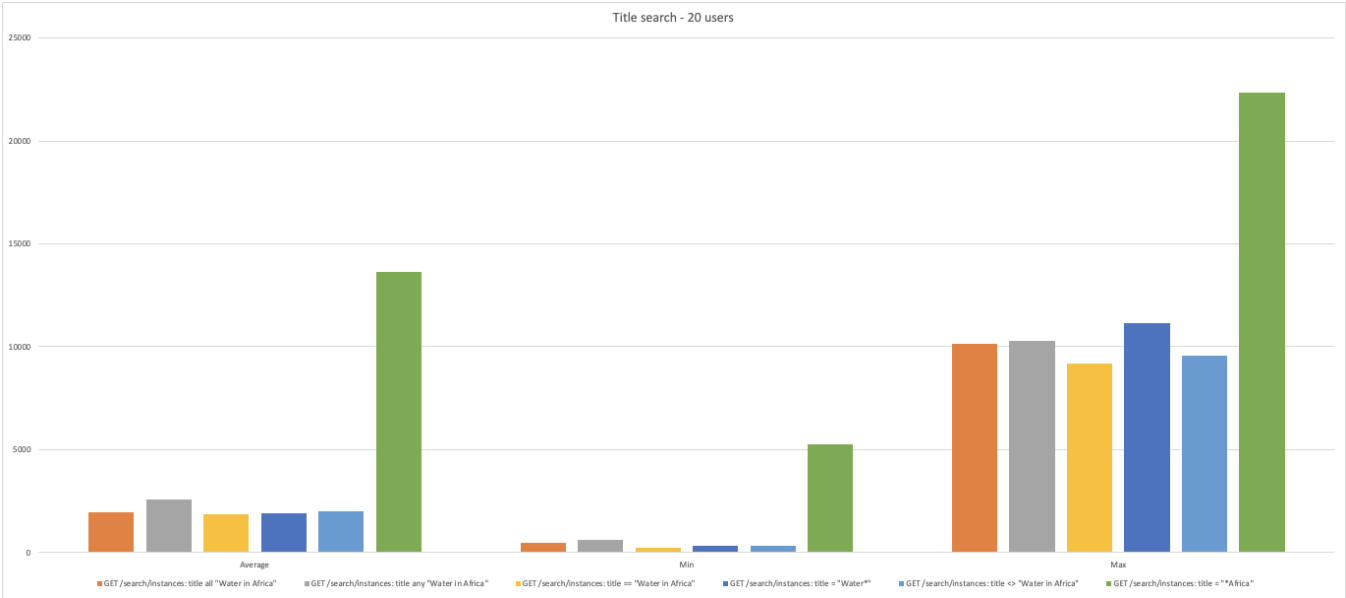
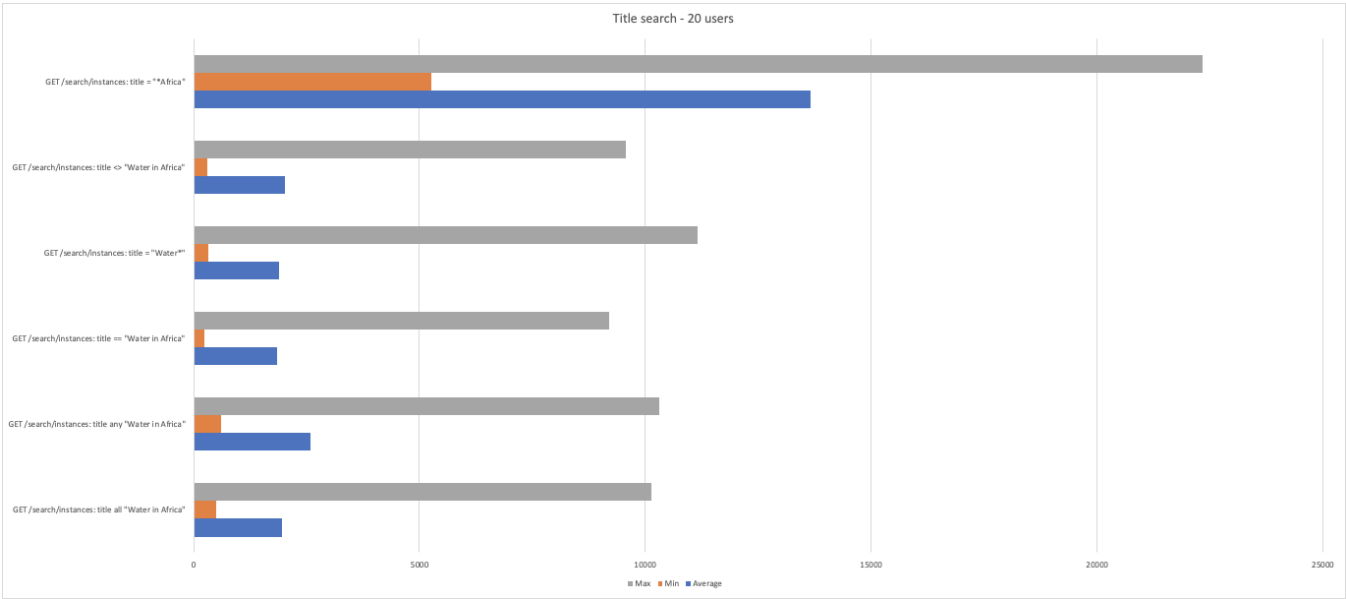
Subjects search

| Label                                                  | Samples | Average | Min  | Max  | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|--------------------------------------------------------|---------|---------|------|------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: subjects = "Washington"         | 714     | 619     | 268  | 2429 | 249,93    | 0.000%  | 3,93683    | 165,66          | 1,96        |
| GET /search/instances: subjects all "Washington"       | 714     | 543     | 253  | 1970 | 290,72    | 0.000%  | 3,96343    | 131,21          | 1,97        |
| GET /search/instances: subjects any "Washington Ibiza" | 714     | 523     | 249  | 2525 | 290,85    | 0.000%  | 3,95388    | 130,01          | 1,98        |
| GET /search/instances: subjects == "Washington"        | 714     | 542     | 250  | 2150 | 297,54    | 0.000%  | 3,96015    | 131,11          | 1,98        |
| GET /search/instances: subjects = "*"Washington"       | 714     | 2044    | 1098 | 3937 | 539,38    | 0.000%  | 3,94844    | 166,34          | 1,96        |
| GET /search/instances: subjects <> "Washington"        | 713     | 711     | 304  | 2200 | 280,11    | 0.000%  | 3,98482    | 143,3           | 1,99        |
| TOTAL                                                  | 4284    | 831     | 249  | 3937 | 643,26    | 0.000%  | 23,38109   | 854,25          | 11,65       |



## Title search

| Label                                              | Samples    | Average     | Min        | Max          | Std. Dev.      | Error %       | Throughput     | Received KB/sec | Sent KB/sec |
|----------------------------------------------------|------------|-------------|------------|--------------|----------------|---------------|----------------|-----------------|-------------|
| GET /search/instances: title all "Water in Africa" | 150        | 1951        | 495        | 10137        | 1927,66        | 0.000%        | 0,8146         | 46,61           | 0,41        |
| GET /search/instances: title any "Water in Africa" | 150        | 2592        | 613        | 10300        | 1921,68        | 0.000%        | 0,81849        | 26,23           | 0,41        |
| GET /search/instances: title == "Water in Africa"  | 150        | 1843        | 238        | 9194         | 1981,65        | 0.000%        | 0,82158        | 1,81            | 0,41        |
| GET /search/instances: title = "Water"             | 150        | 1896        | 321        | 11165        | 2001,01        | 0.000%        | 0,81678        | 34,4            | 0,4         |
| GET /search/instances: title <> "Water in Africa"  | 150        | 2019        | 311        | 9578         | 1961,57        | 0.000%        | 0,82287        | 29,58           | 0,41        |
| GET /search/instances: title = "*Africa"           | 150        | 13648       | 5259       | 22343        | 3301,47        | 0.000%        | 0,79475        | 21,33           | 0,39        |
| <b>TOTAL</b>                                       | <b>901</b> | <b>3989</b> | <b>238</b> | <b>22343</b> | <b>4869,08</b> | <b>0.000%</b> | <b>4,71222</b> | <b>154,06</b>   | <b>2,34</b> |



## Performance test results for 20 user

On average, search results fall between **300 and 600 ms**. Exceptions are requests in which a wildcard is present at the beginning or in the middle of the search request. There are **errors** for several kinds of the search requests.

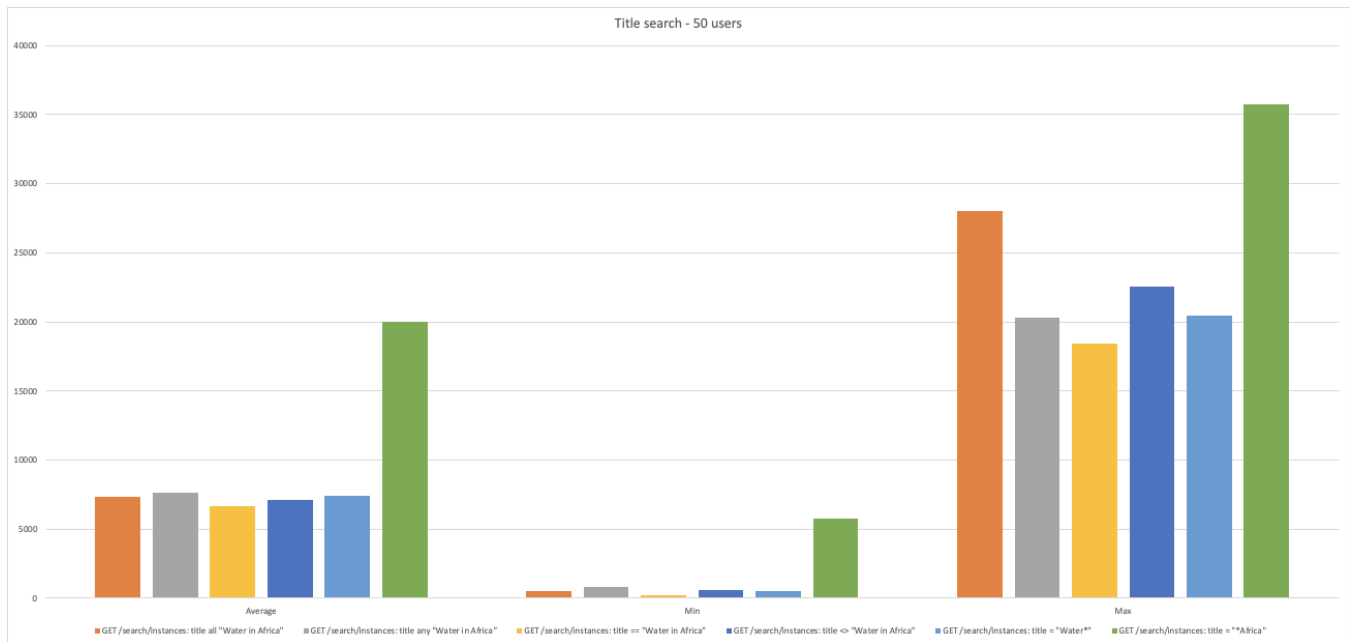
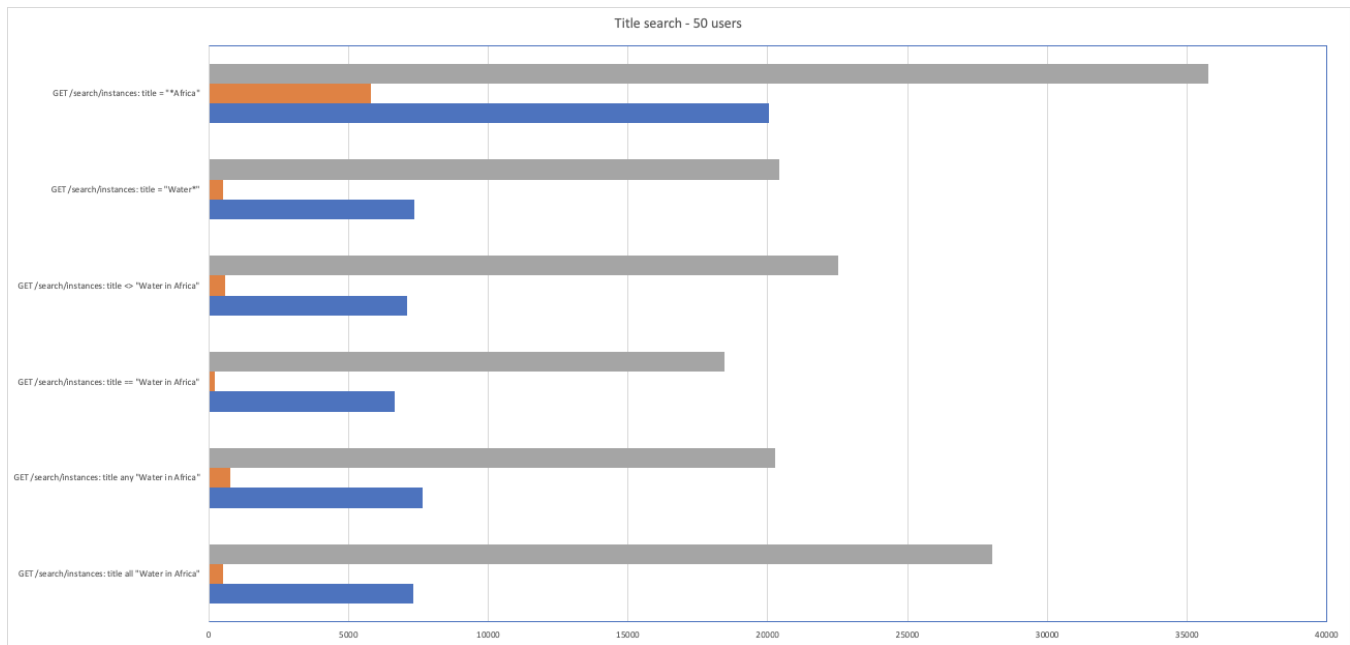
| Type of search  | Average response time in ms | Errors |
|-----------------|-----------------------------|--------|
| Regular         | 730                         | no     |
| Wildcard        | 900                         | no     |
| Wildcard prefix | 17500                       | yes    |

[20users\\_search\\_results.zip](#)

## Aggregated results for 50 users

### Title search

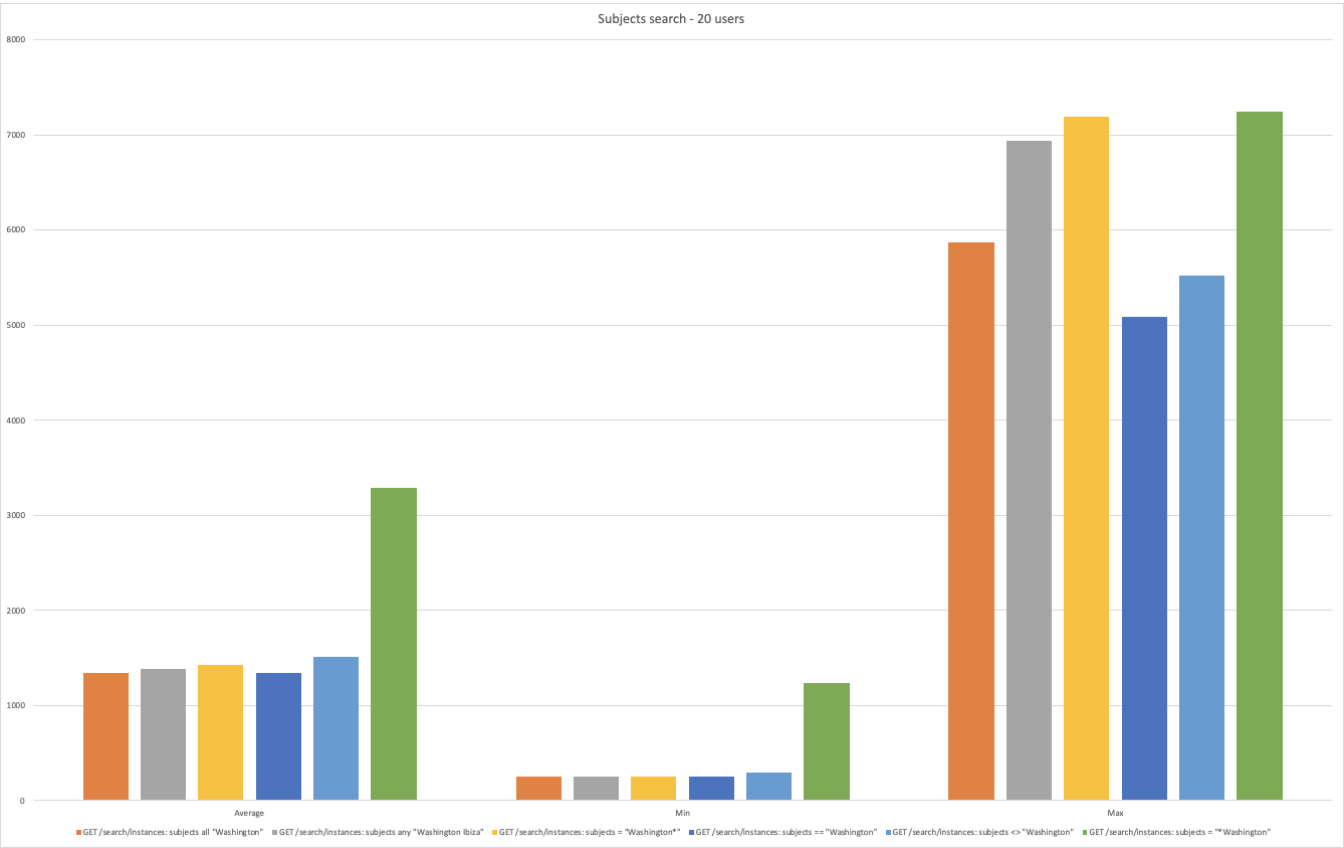
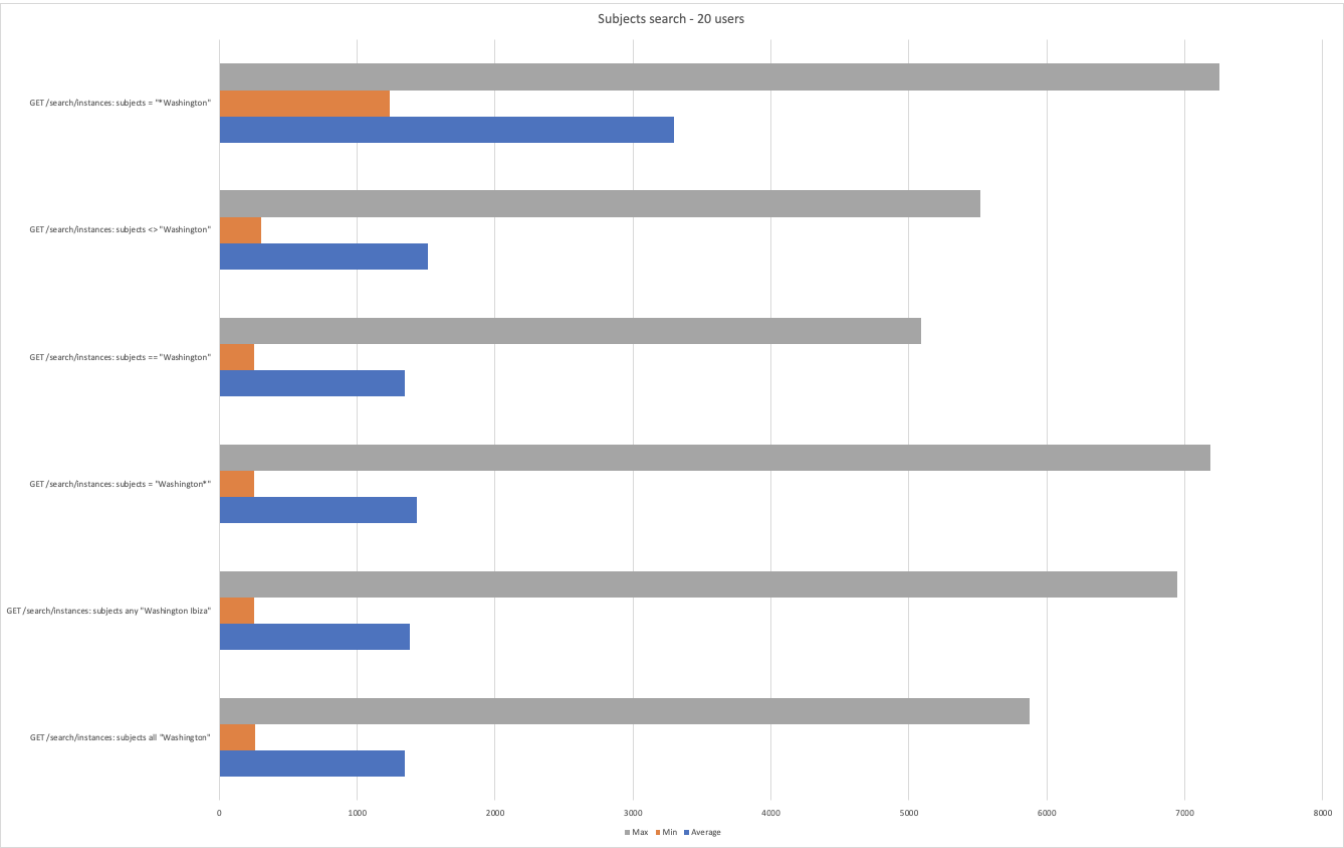
| Label                                              | Samples    | Average     | Min        | Max          | Std. Dev.      | Error %       | Throughput     | Received KB/sec | Sent KB/sec |
|----------------------------------------------------|------------|-------------|------------|--------------|----------------|---------------|----------------|-----------------|-------------|
| GET /search/instances: title all "Water in Africa" | 156        | 7340        | 527        | 28049        | 5118,45        | 0.000%        | 0.80947        | 46,31           | 0,4         |
| GET /search/instances: title any "Water in Africa" | 155        | 7652        | 787        | 20267        | 4474,69        | 0.000%        | 0.82581        | 26,47           | 0,41        |
| GET /search/instances: title == "Water in Africa"  | 155        | 6655        | 229        | 18439        | 4578,43        | 0.000%        | 0.81409        | 1,8             | 0,41        |
| GET /search/instances: title <> "Water in Africa"  | 155        | 7103        | 595        | 22535        | 4857,83        | 0.000%        | 0.81678        | 29,47           | 0,41        |
| GET /search/instances: title = "Water*"            | 156        | 7376        | 506        | 20427        | 4674,32        | 0.000%        | 0.81298        | 34,25           | 0,4         |
| GET /search/instances: title = "*Africa"           | 155        | 20032       | 5789       | 35773        | 5350,91        | 0.645%        | 0.78065        | 20,83           | 0,38        |
| <b>TOTAL</b>                                       | <b>933</b> | <b>9347</b> | <b>229</b> | <b>35773</b> | <b>6811,52</b> | <b>0.107%</b> | <b>4,63918</b> | <b>151,85</b>   | <b>2,3</b>  |



## Subjects search

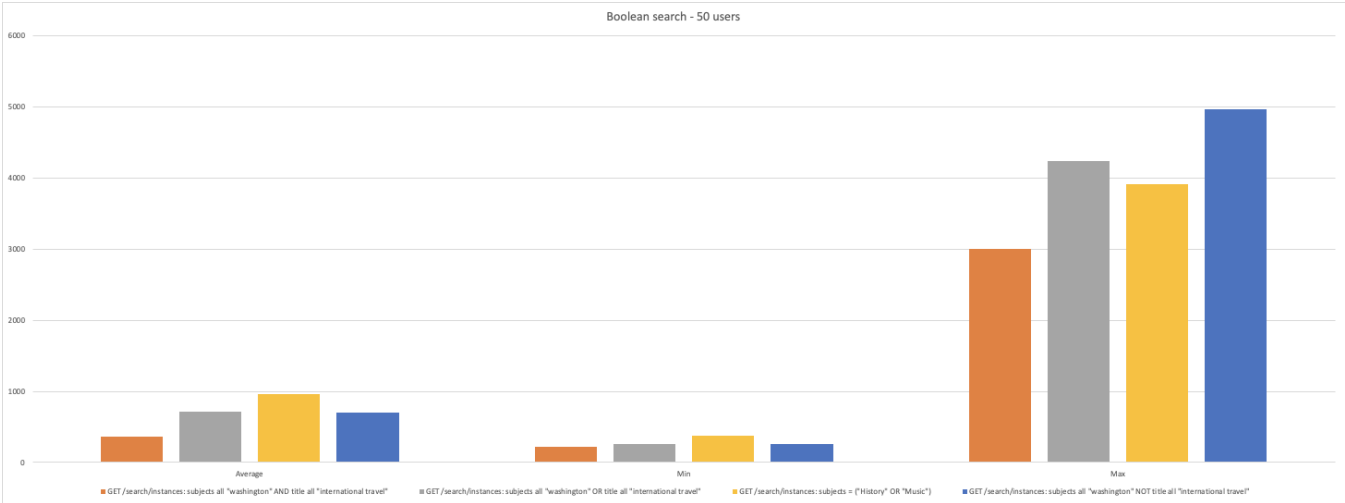
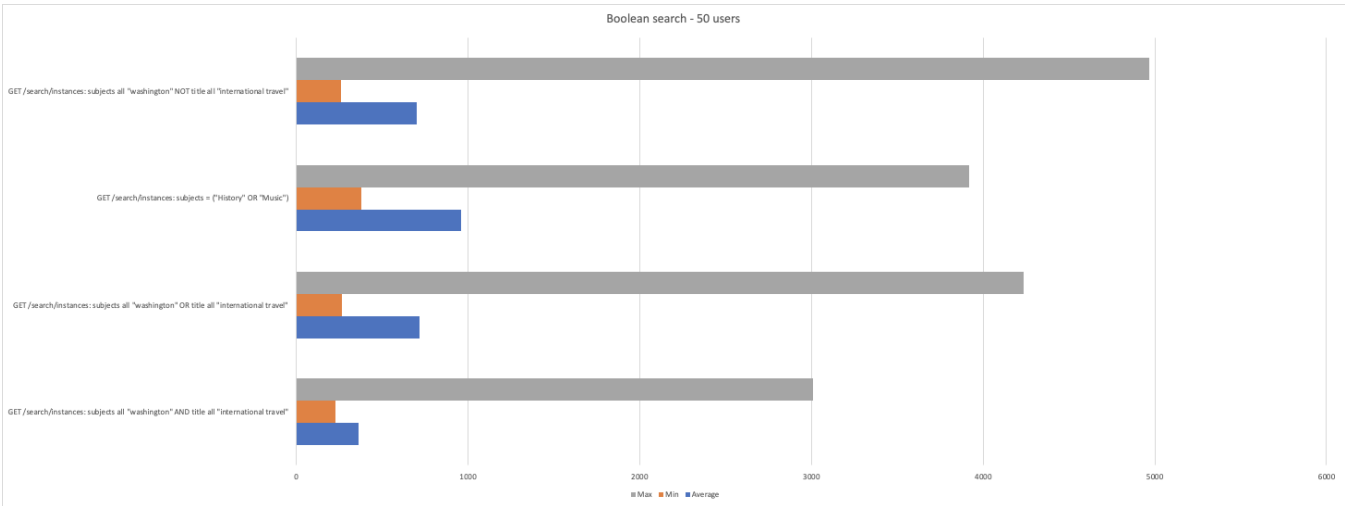
| Label                                                  | Samples | Average | Min | Max  | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|--------------------------------------------------------|---------|---------|-----|------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: subjects all "Washington"       | 829     | 1345    | 257 | 5874 | 760,44    | 0.000%  | 4,56573    | 151,16          | 2,27        |
| GET /search/instances: subjects any "Washington Ibiza" | 828     | 1383    | 251 | 6942 | 774,51    | 0.000%  | 4,60548    | 151,45          | 2,31        |
| GET /search/instances: subjects = "Washington*"        | 829     | 1429    | 256 | 7188 | 746,61    | 0.000%  | 4,58921    | 193,23          | 2,28        |
| GET /search/instances: subjects == "Washington"        | 828     | 1346    | 251 | 5085 | 738,58    | 0.000%  | 4,60404    | 152,44          | 2,3         |

|                                                 |      |      |      |      |         |        |          |        |       |
|-------------------------------------------------|------|------|------|------|---------|--------|----------|--------|-------|
| GET /search/instances: subjects <> "Washington" | 828  | 1514 | 300  | 5520 | 752,72  | 0.000% | 4,60699  | 165,46 | 2,3   |
| GET /search/instances: subjects = ""Washington" | 829  | 3294 | 1235 | 7249 | 987,5   | 0.000% | 4,56209  | 192,17 | 2,27  |
| TOTAL                                           | 4972 | 1719 | 251  | 7249 | 1066,19 | 0.000% | 27,07132 | 989,06 | 13,49 |



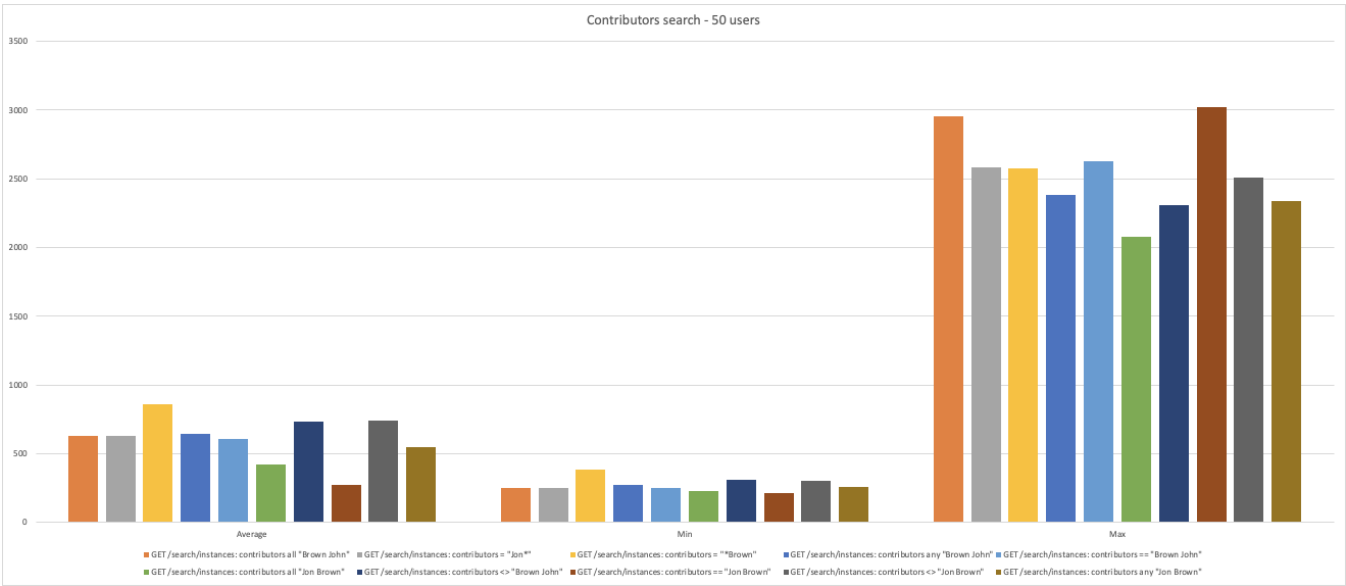
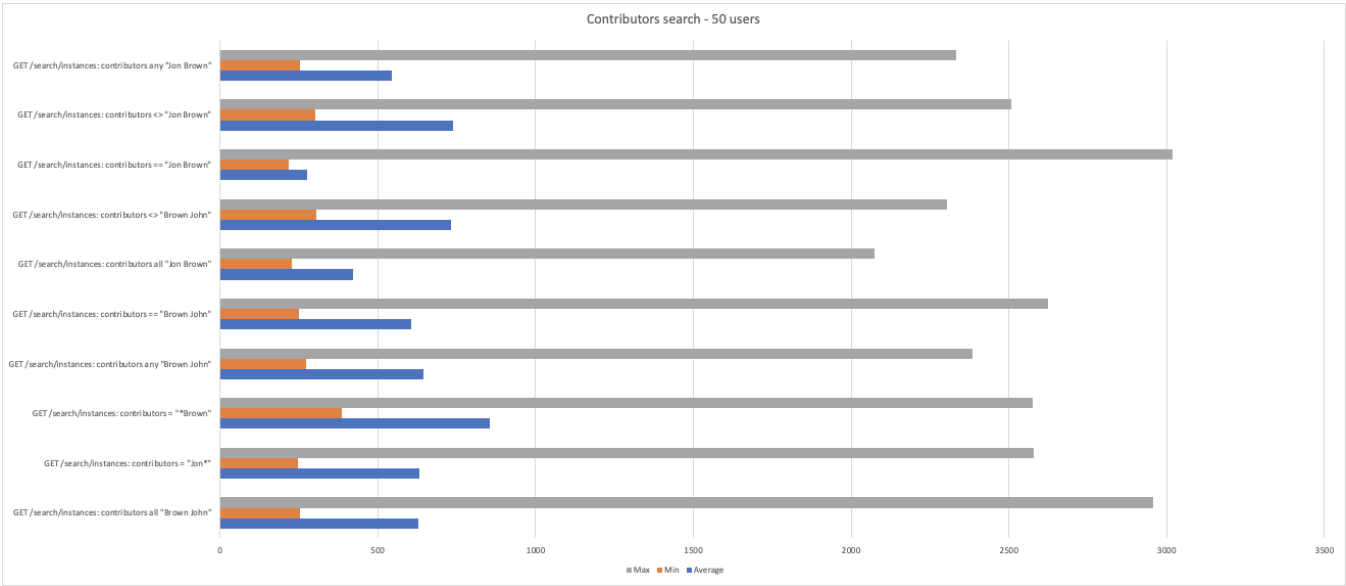
Boolean search

| Label                                                                                 | Samples | Average | Min | Max  | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|---------------------------------------------------------------------------------------|---------|---------|-----|------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: subjects all "washington" AND title all "international travel" | 3229    | 360     | 226 | 3009 | 188,38    | 0.000%  | 17,91242   | 38,65           | 9,6         |
| GET /search/instances: subjects all "washington" OR title all "international travel"  | 3229    | 717     | 264 | 4234 | 308,8     | 0.000%  | 17,8891    | 604,28          | 9,57        |
| GET /search/instances: subjects = ("History" OR "Music")                              | 3229    | 962     | 377 | 3920 | 340,08    | 0.000%  | 17,87781   | 589,53          | 9,18        |
| GET /search/instances: subjects all "washington" NOT title all "international travel" | 3229    | 702     | 260 | 4966 | 331,48    | 0.000%  | 17,86584   | 591,57          | 9,58        |
| TOTAL                                                                                 | 12917   | 685     | 226 | 4966 | 367,54    | 0.000%  | 70,93355   | 1809,1          | 37,61       |



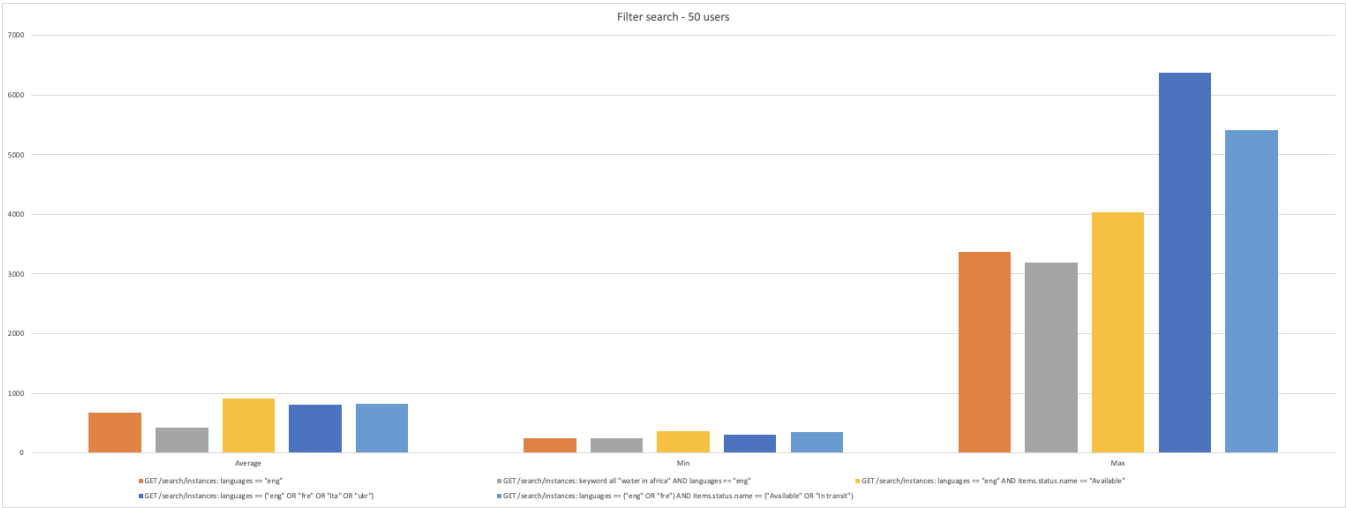
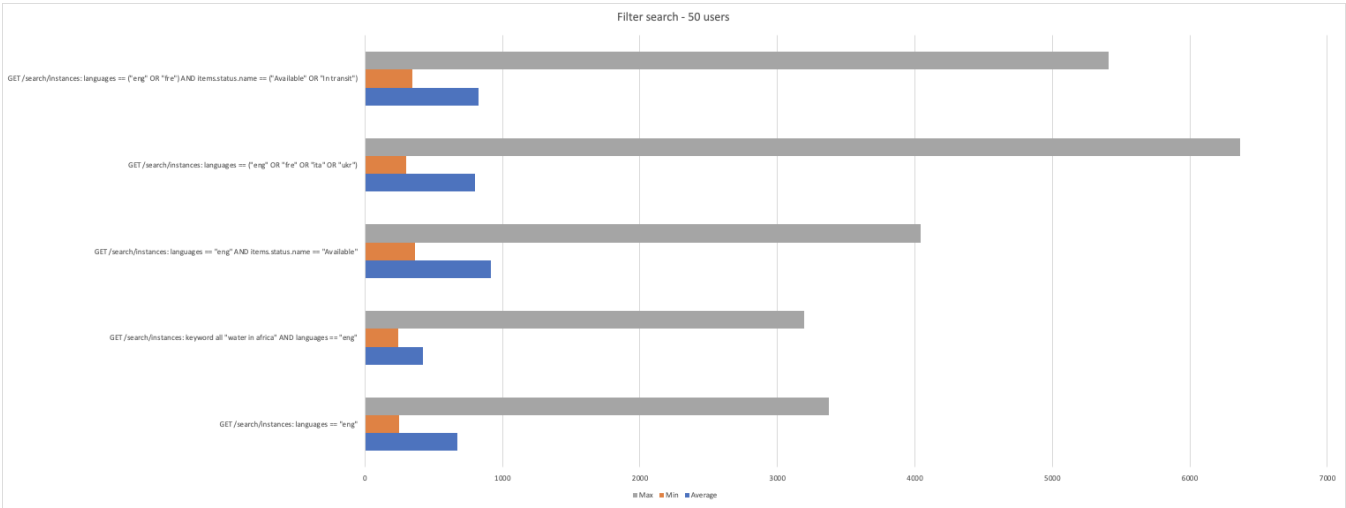
Contributors search

| Label                                                | Samples | Average | Min | Max  | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|------------------------------------------------------|---------|---------|-----|------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: contributors all "Brown John" | 1440    | 628     | 252 | 2957 | 269,19    | 0.000%  | 7,93546    | 304,82          | 3,97        |
| GET /search/instances: contributors = "Jon*"         | 1439    | 631     | 248 | 2580 | 252,48    | 0.000%  | 7,97044    | 321,54          | 3,94        |
| GET /search/instances: contributors = "*Brown"       | 1439    | 856     | 385 | 2575 | 276,68    | 0.000%  | 7,97933    | 329,24          | 3,96        |
| GET /search/instances: contributors any "Brown John" | 1439    | 645     | 271 | 2383 | 248,25    | 0.000%  | 7,97791    | 306,48          | 3,99        |
| GET /search/instances: contributors == "Brown John"  | 1439    | 605     | 250 | 2624 | 237,86    | 0.000%  | 7,99693    | 300,6           | 4,02        |
| GET /search/instances: contributors all "Jon Brown"  | 1439    | 421     | 226 | 2074 | 246,35    | 0.000%  | 7,99493    | 208,14          | 3,99        |
| GET /search/instances: contributors <> "Brown John"  | 1439    | 731     | 306 | 2305 | 269,48    | 0.000%  | 8,00565    | 287,55          | 4,03        |
| GET /search/instances: contributors == "Jon Brown"   | 1439    | 275     | 216 | 3018 | 131,94    | 0.000%  | 8,05553    | 2,25            | 4,04        |
| GET /search/instances: contributors <> "Jon Brown"   | 1439    | 738     | 303 | 2508 | 284,31    | 0.000%  | 8,04697    | 288,24          | 4,04        |
| GET /search/instances: contributors any "Jon Brown"  | 1439    | 544     | 254 | 2334 | 273,1     | 0.000%  | 8,01345    | 244             | 4           |
| TOTAL                                                | 14392   | 608     | 216 | 3138 | 297,8     | 0.000%  | 77,93024   | 2528,86         | 38,95       |



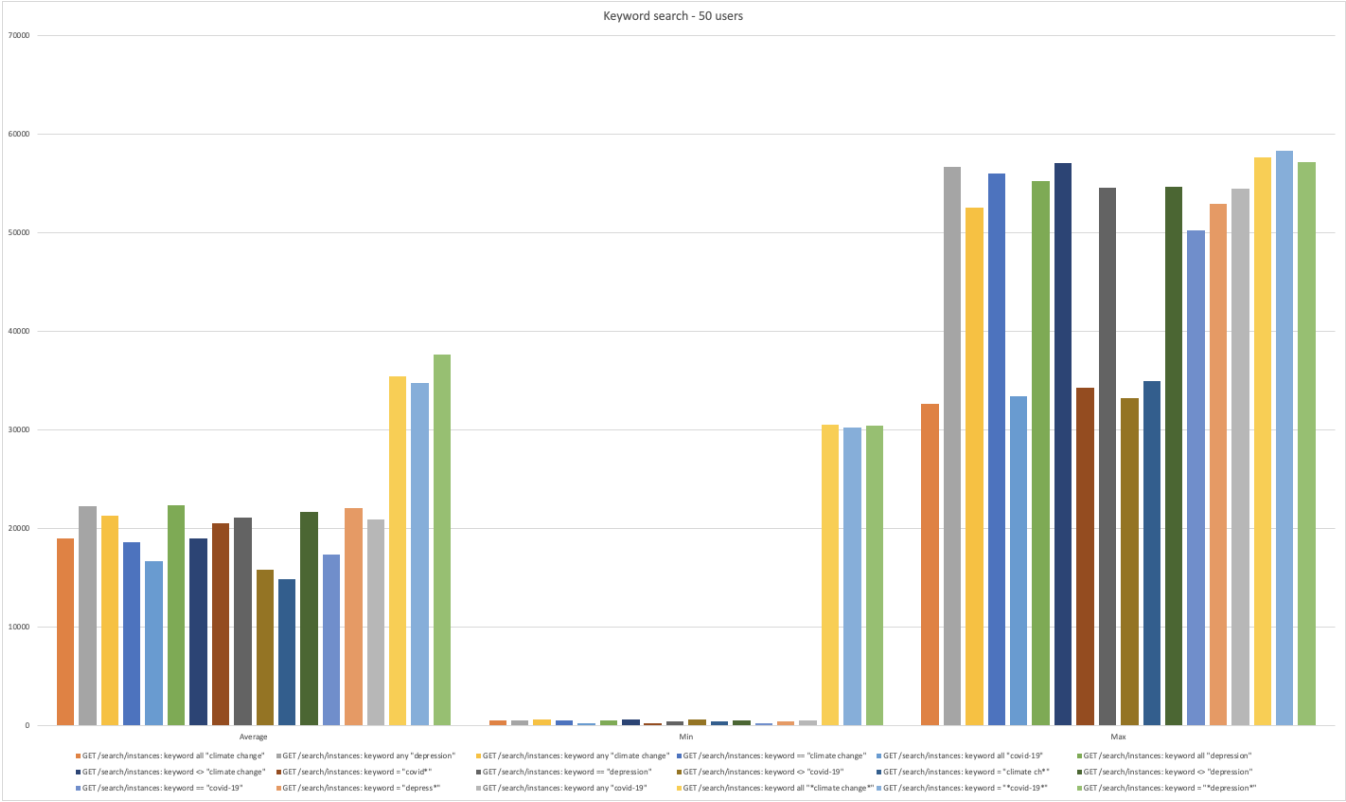
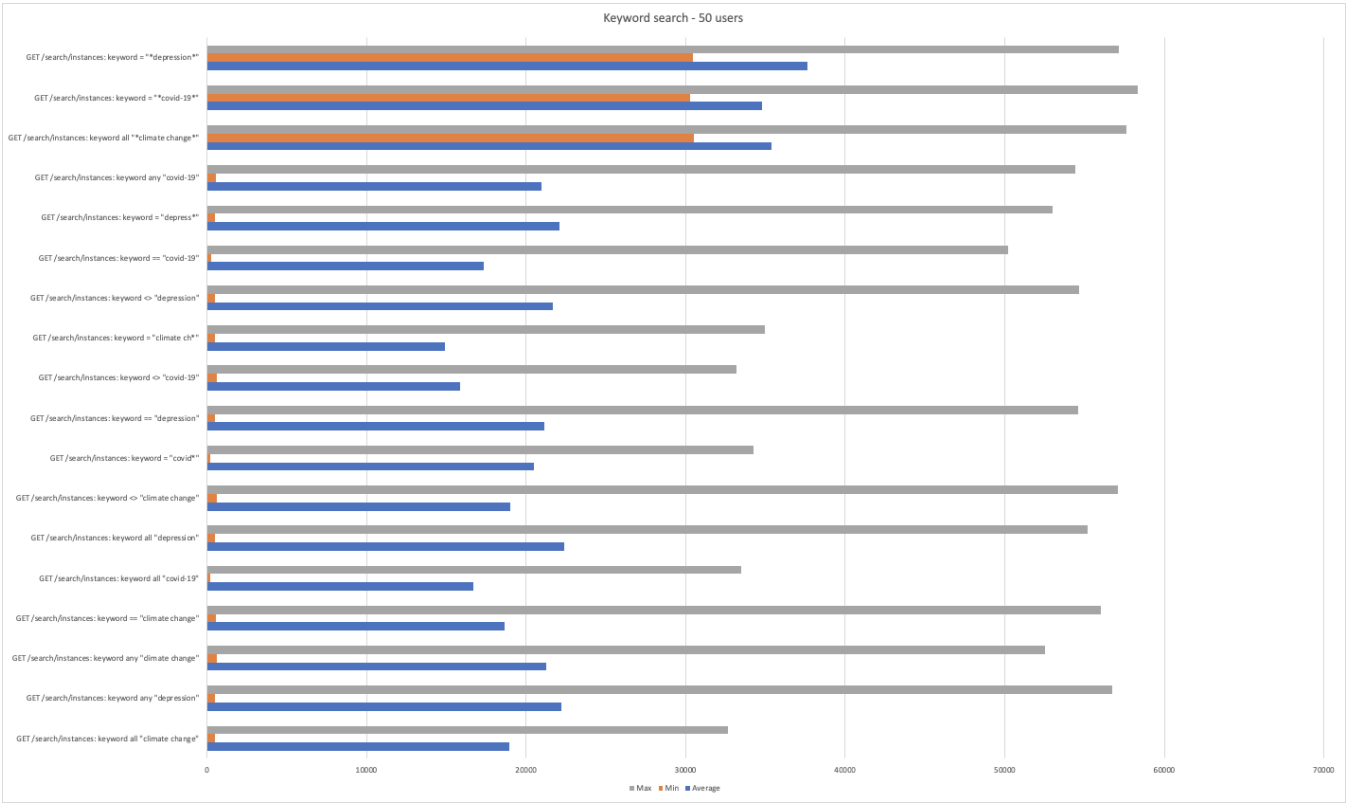
## Filters search

| Label                                                                                                       | Sampl<br>es | Avera<br>ge | Min | Max  | Std.<br>Dev. | Error<br>% | Throughp<br>ut | Received KB<br>/sec | Sent KB<br>/sec |
|-------------------------------------------------------------------------------------------------------------|-------------|-------------|-----|------|--------------|------------|----------------|---------------------|-----------------|
| GET /search/instances: languages == "eng"                                                                   | 2436        | 671         | 246 | 3372 | 260,72       | 0.000%     | 13,48337       | 480,09              | 6,65            |
| GET /search/instances: keyword all "water in africa" AND languages == "eng"                                 | 2435        | 423         | 239 | 3195 | 251,57       | 0.000%     | 13,5238        | 178,44              | 7,17            |
| GET /search/instances: languages == "eng" AND items.status.name == "Available"                              | 2436        | 913         | 364 | 4039 | 285,37       | 0.000%     | 13,49158       | 482,43              | 7,25            |
| GET /search/instances: languages == ("eng" OR "fre" OR "ita" OR "ukr")                                      | 2436        | 801         | 301 | 6368 | 286,68       | 0.000%     | 13,48621       | 478,41              | 7,24            |
| GET /search/instances: languages == ("eng" OR "fre") AND items.status.name == ("Available" OR "In transit") | 2436        | 828         | 343 | 5409 | 287,6        | 0.000%     | 13,50123       | 482,36              | 7,84            |
| TOTAL                                                                                                       | 12180       | 727         | 239 | 6368 | 323,66       | 0.000%     | 66,93117       | 2084,97             | 35,86           |



## Keyword search

| Label                                               | Samples | Average | Min   | Max   | Std. Dev. | Error %  | Throughput | Received KB/sec | Sent KB/sec |
|-----------------------------------------------------|---------|---------|-------|-------|-----------|----------|------------|-----------------|-------------|
| GET /search/instances: keyword all "climate change" | 23      | 18961   | 527   | 32658 | 13331,04  | 0.000%   | 0,12085    | 3,83            | 0,06        |
| GET /search/instances: keyword any "depression"     | 23      | 22228   | 506   | 56717 | 17704,51  | 21.739%  | 0,1258     | 3,17            | 0,06        |
| GET /search/instances: keyword any "climate change" | 23      | 21280   | 620   | 52553 | 16744,18  | 8.696%   | 0,12131    | 4               | 0,06        |
| GET /search/instances: keyword == "climate change"  | 23      | 18668   | 538   | 56052 | 16532,26  | 4.348%   | 0,12532    | 4,34            | 0,06        |
| GET /search/instances: keyword all "covid-19"       | 22      | 16687   | 222   | 33454 | 13686,83  | 9.091%   | 0,12098    | 0,04            | 0,06        |
| GET /search/instances: keyword all "depression"     | 23      | 22371   | 504   | 55208 | 15476,24  | 8.696%   | 0,12171    | 3,22            | 0,06        |
| GET /search/instances: keyword <> "climate change"  | 23      | 19014   | 623   | 57113 | 17956,8   | 21.739%  | 0,12564    | 3,53            | 0,06        |
| GET /search/instances: keyword = "covid"            | 22      | 20499   | 234   | 34259 | 12695,85  | 13.636%  | 0,12178    | 0,04            | 0,06        |
| GET /search/instances: keyword == "depression"      | 23      | 21149   | 495   | 54581 | 14703,85  | 4.348%   | 0,12205    | 3,74            | 0,06        |
| GET /search/instances: keyword <> "covid-19"        | 22      | 15861   | 605   | 33208 | 12980,71  | 0.000%   | 0,11696    | 4,22            | 0,06        |
| GET /search/instances: keyword = "climate ch"       | 23      | 14909   | 482   | 34970 | 12772,37  | 4.348%   | 0,12115    | 4,72            | 0,06        |
| GET /search/instances: keyword <> "depression"      | 23      | 21670   | 528   | 54665 | 14862,29  | 8.696%   | 0,12173    | 3,95            | 0,06        |
| GET /search/instances: keyword == "covid-19"        | 22      | 17344   | 243   | 50225 | 14811,37  | 4.545%   | 0,11711    | 0,03            | 0,06        |
| GET /search/instances: keyword = "depress"          | 22      | 22117   | 489   | 52986 | 14214,88  | 9.091%   | 0,11657    | 3,81            | 0,06        |
| GET /search/instances: keyword any "covid-19"       | 22      | 20953   | 540   | 54450 | 17118,18  | 9.091%   | 0,12148    | 3,6             | 0,06        |
| GET /search/instances: keyword all "climate change" | 23      | 35409   | 30518 | 57613 | 8409,53   | 86.957%  | 0,11358    | 0,72            | 0,06        |
| GET /search/instances: keyword = "covid-19"         | 22      | 34814   | 30302 | 58312 | 8454,52   | 100.000% | 0,11425    | 0,06            | 0,06        |
| GET /search/instances: keyword = "depression"       | 22      | 37652   | 30465 | 57139 | 9682,13   | 86.364%  | 0,10945    | 0,72            | 0,05        |
| TOTAL                                               | 407     | 22241   | 222   | 58312 | 15715,48  | 22.113%  | 1,99099    | 43,81           | 0,99        |



Performance test results for 50 user

On average, search results fall between 300 and 700 ms. Exceptions are requests in which a wildcard is present at the beginning or in the middle of the search request. There are errors for several kinds of the search requests.

| Type of search | Average response time in ms | Errors |
|----------------|-----------------------------|--------|
|----------------|-----------------------------|--------|

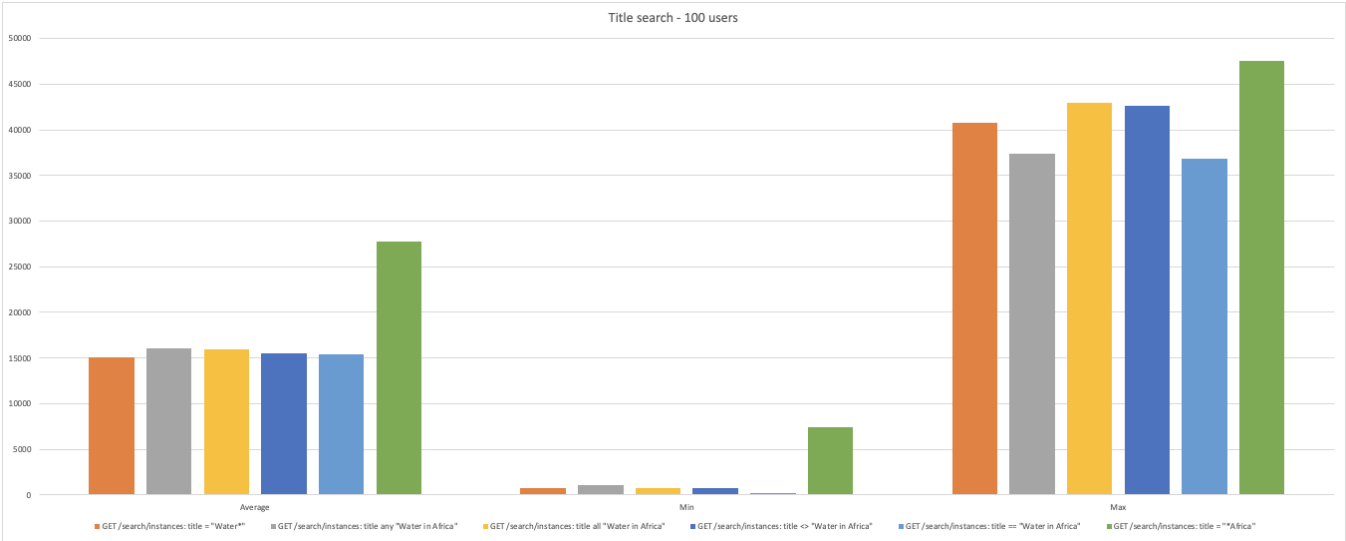
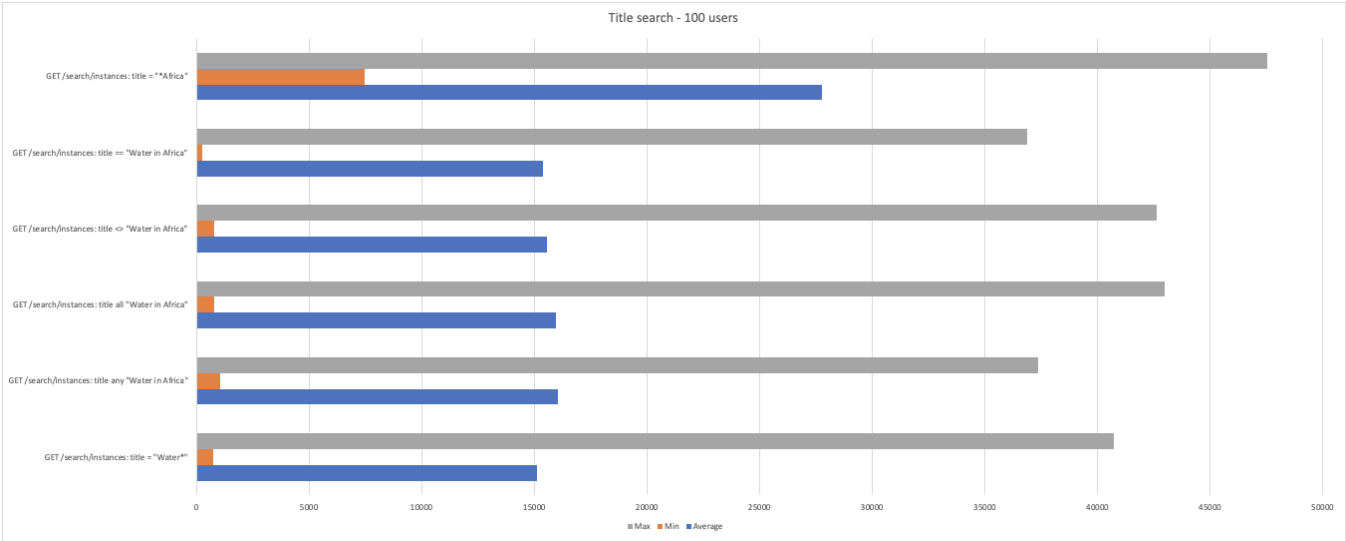
|                 |       |     |
|-----------------|-------|-----|
| Regular         | 1700  | no  |
| Wildcard        | 7300  | no  |
| Wildcard prefix | 22000 | yes |

50users\_test\_results.zip

Aggregated results for 100 users

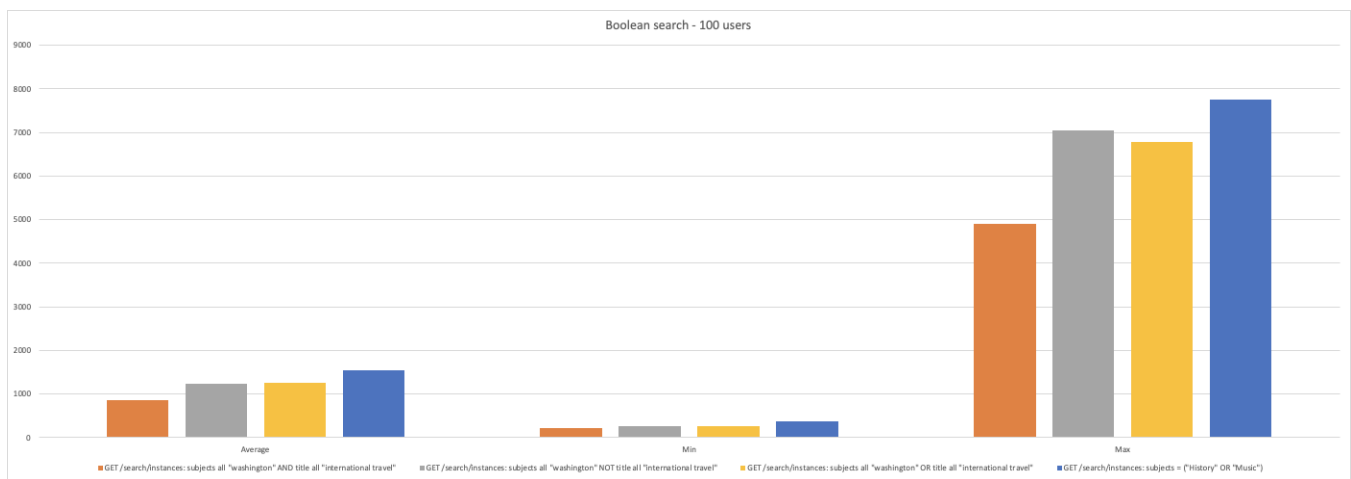
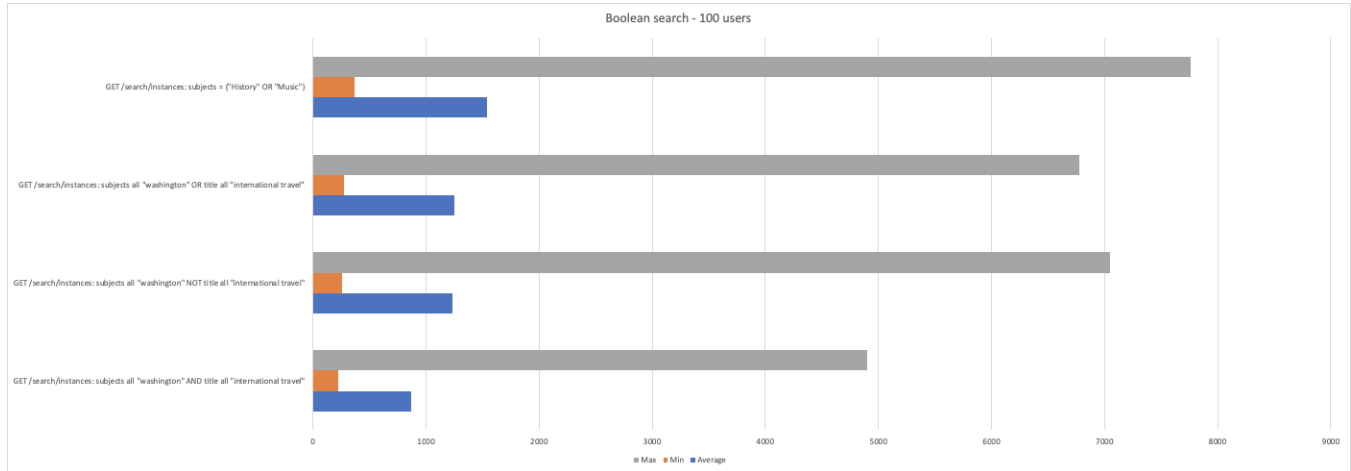
Title search

| Label                                              | Samples | Average | Min  | Max   | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|----------------------------------------------------|---------|---------|------|-------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: title = "Water"             | 220     | 15103   | 762  | 40741 | 7988,67   | 0.000%  | 0,86089    | 36,27           | 0,42        |
| GET /search/instances: title any "Water in Africa" | 219     | 16035   | 1055 | 37390 | 7538,32   | 0.000%  | 0,86169    | 27,62           | 0,43        |
| GET /search/instances: title all "Water in Africa" | 220     | 15951   | 776  | 42998 | 8256,11   | 0.000%  | 0,85974    | 49,19           | 0,43        |
| GET /search/instances: title <> "Water in Africa"  | 219     | 15554   | 798  | 42642 | 7782,09   | 0.000%  | 0,86365    | 31,05           | 0,43        |
| GET /search/instances: title == "Water in Africa"  | 219     | 15380   | 252  | 36868 | 8475,8    | 0.000%  | 0,86753    | 1,92            | 0,43        |
| GET /search/instances: title = "Africa"            | 219     | 27790   | 7462 | 47525 | 8350,55   | 2.740%  | 0,83288    | 21,76           | 0,41        |
| TOTAL                                              | 1317    | 17622   | 252  | 47525 | 9270,13   | 0.456%  | 4,91717    | 160,38          | 2,44        |



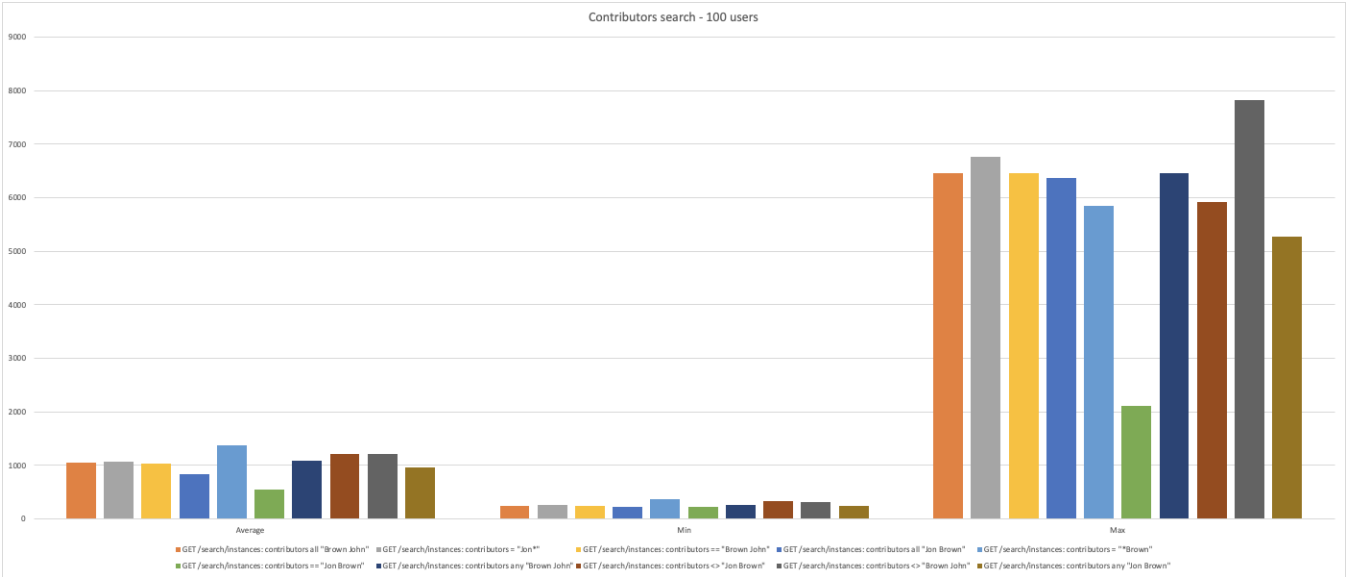
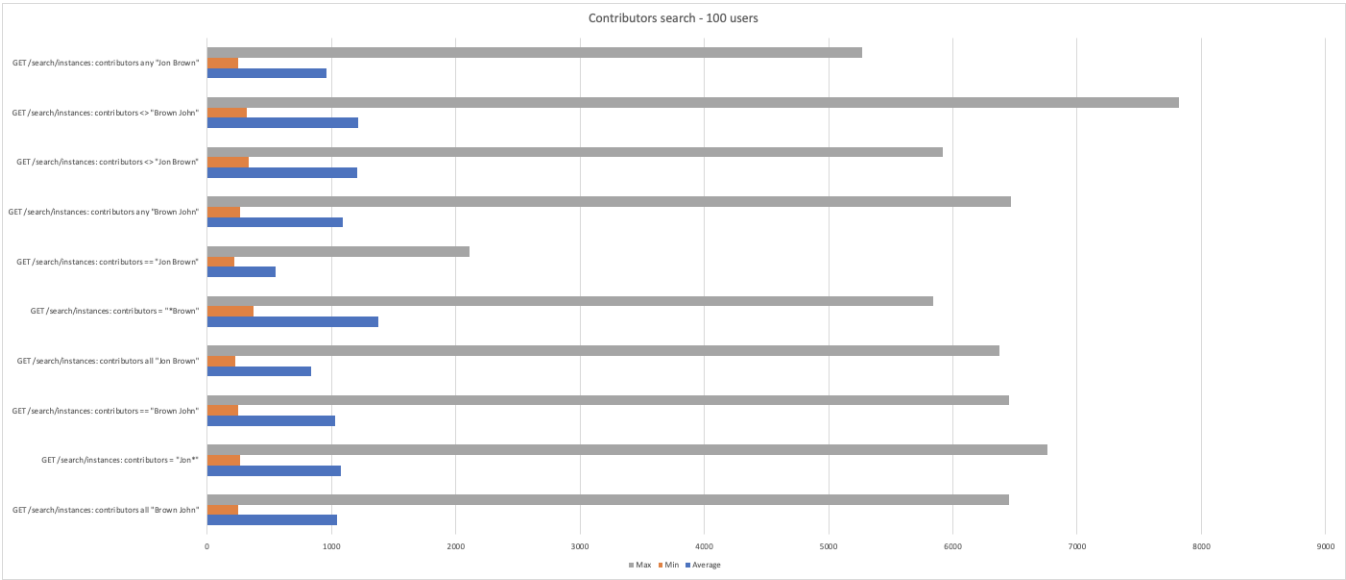
Boolean search

| Label                                                                                 | Samples      | Average     | Min        | Max         | Std. Dev.     | Error %       | Throughput      | Received KB/sec | Sent KB/sec  |
|---------------------------------------------------------------------------------------|--------------|-------------|------------|-------------|---------------|---------------|-----------------|-----------------|--------------|
| GET /search/instances: subjects all "washington" AND title all "international travel" | 4499         | 870         | 227        | 4899        | 403,15        | 0.000%        | 18,69023        | 40,34           | 10,02        |
| GET /search/instances: subjects all "washington" NOT title all "international travel" | 4498         | 1233        | 256        | 7046        | 540,31        | 0.000%        | 18,68848        | 618,78          | 10,02        |
| GET /search/instances: subjects all "washington" OR title all "international travel"  | 4499         | 1252        | 272        | 6773        | 528,84        | 0.000%        | 18,65652        | 630,19          | 9,98         |
| GET /search/instances: subjects = ("History" OR "Music")                              | 4498         | 1539        | 371        | 7761        | 540,98        | 0.000%        | 18,69625        | 616,51          | 9,6          |
| <b>TOTAL</b>                                                                          | <b>17995</b> | <b>1223</b> | <b>227</b> | <b>7761</b> | <b>559,44</b> | <b>0.000%</b> | <b>74,03765</b> | <b>1888,2</b>   | <b>39,26</b> |



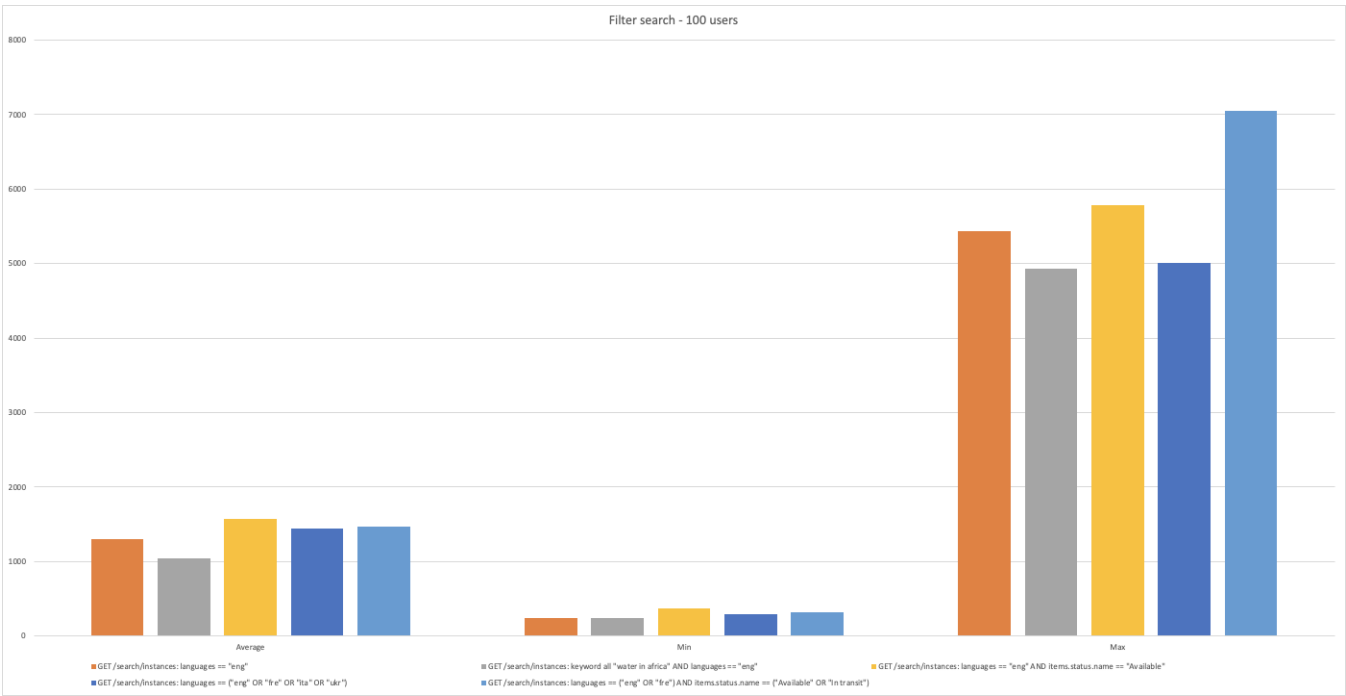
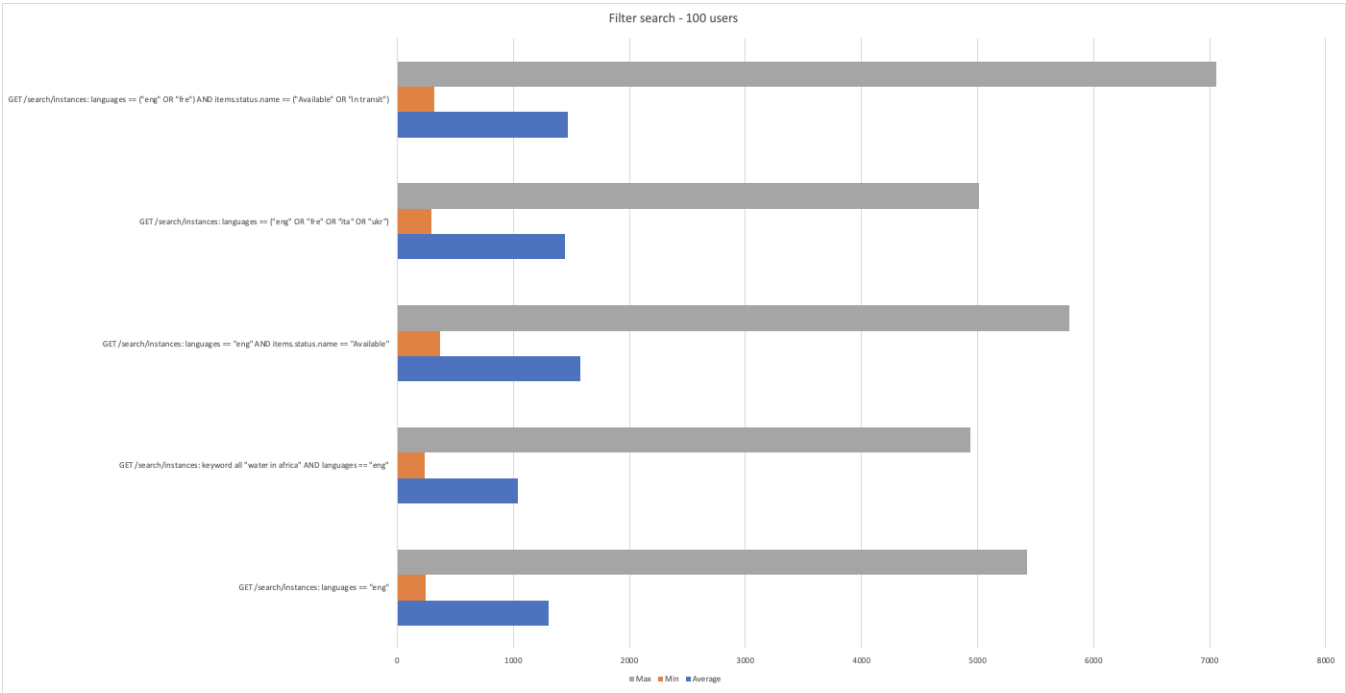
## Contributors search

| Label                                                | Samples      | Average     | Min        | Max         | Std. Dev.     | Error %       | Throughput      | Received KB/sec | Sent KB/sec  |
|------------------------------------------------------|--------------|-------------|------------|-------------|---------------|---------------|-----------------|-----------------|--------------|
| GET /search/instances: contributors all "Brown John" | 2120         | 1048        | 250        | 6453        | 495,17        | 0.000%        | 8,80267         | 338,12          | 4,4          |
| GET /search/instances: contributors = "Jon*"         | 2120         | 1076        | 262        | 6760        | 512,4         | 0.000%        | 8,79675         | 354,51          | 4,35         |
| GET /search/instances: contributors == "Brown John"  | 2120         | 1032        | 251        | 6451        | 494,49        | 0.000%        | 8,82249         | 331,65          | 4,44         |
| GET /search/instances: contributors all "Jon Brown"  | 2119         | 837         | 229        | 6374        | 427,73        | 0.000%        | 8,84206         | 230,2           | 4,41         |
| GET /search/instances: contributors = "**Brown"      | 2120         | 1374        | 373        | 5844        | 505,27        | 0.000%        | 8,81959         | 364,34          | 4,38         |
| GET /search/instances: contributors == "Jon Brown"   | 2119         | 550         | 217        | 2114        | 257,28        | 0.000%        | 8,89368         | 2,49            | 4,46         |
| GET /search/instances: contributors any "Brown John" | 2120         | 1093        | 265        | 6468        | 483           | 0.000%        | 8,82572         | 339,03          | 4,41         |
| GET /search/instances: contributors <> "Jon Brown"   | 2119         | 1207        | 331        | 5921        | 517,82        | 0.000%        | 8,88347         | 318,93          | 4,46         |
| GET /search/instances: contributors <> "Brown John"  | 2120         | 1217        | 318        | 7820        | 513,94        | 0.000%        | 8,84066         | 317,78          | 4,45         |
| GET /search/instances: contributors any "Jon Brown"  | 2119         | 962         | 251        | 5267        | 481,21        | 0.000%        | 8,87301         | 270,14          | 4,43         |
| <b>TOTAL</b>                                         | <b>21197</b> | <b>1040</b> | <b>217</b> | <b>7820</b> | <b>521,22</b> | <b>0.000%</b> | <b>87,25702</b> | <b>2832,67</b>  | <b>43,61</b> |



## Filter search

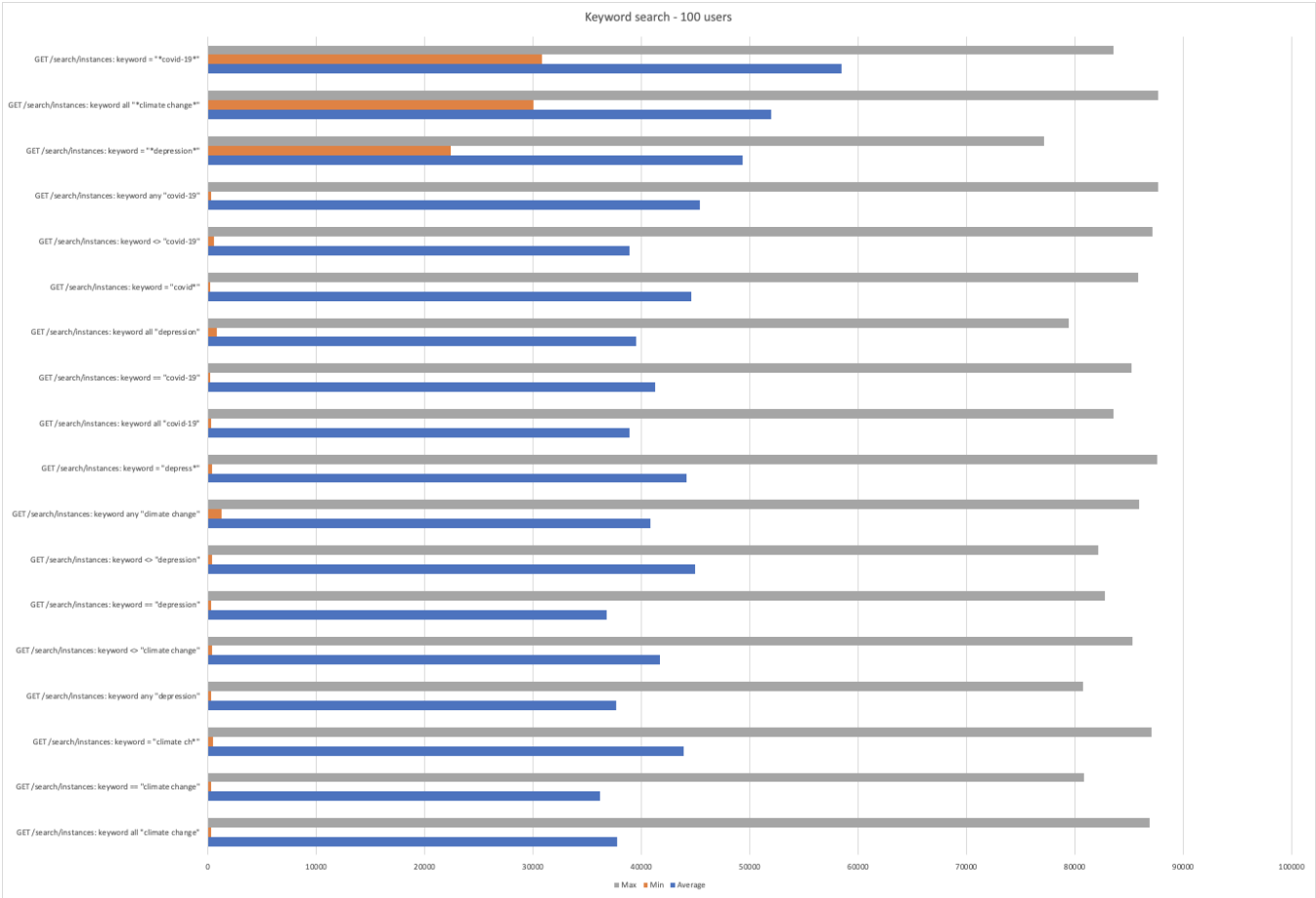
| Label                                                                                                       | Sampl<br>es | Avera<br>ge | Min | Max  | Std.<br>Dev. | Error<br>% | Throughp<br>ut | Received KB<br>/sec | Sent KB<br>/sec |
|-------------------------------------------------------------------------------------------------------------|-------------|-------------|-----|------|--------------|------------|----------------|---------------------|-----------------|
| GET /search/instances: languages == "eng"                                                                   | 3230        | 1301        | 246 | 5430 | 506,81       | 0.000%     | 13,38544       | 476,91              | 6,6             |
| GET /search/instances: keyword all "water in africa" AND languages == "eng"                                 | 3229        | 1037        | 240 | 4937 | 472,69       | 0.000%     | 13,46758       | 177,71              | 7,14            |
| GET /search/instances: languages == "eng" AND items.status.name == "Available"                              | 3229        | 1574        | 366 | 5789 | 515,87       | 0.000%     | 13,40646       | 478,94              | 7,2             |
| GET /search/instances: languages == ("eng" OR "fre" OR "ita" OR "ukr")                                      | 3230        | 1448        | 293 | 5014 | 515,17       | 0.000%     | 13,35125       | 473,4               | 7,17            |
| GET /search/instances: languages == ("eng" OR "fre") AND items.status.name == ("Available" OR "In transit") | 3229        | 1469        | 319 | 7055 | 521,05       | 0.000%     | 13,42876       | 480,18              | 7,8             |
| TOTAL                                                                                                       | 16148       | 1366        | 240 | 7055 | 539,71       | 0.000%     | 66,28981       | 2065,02             | 35,51           |

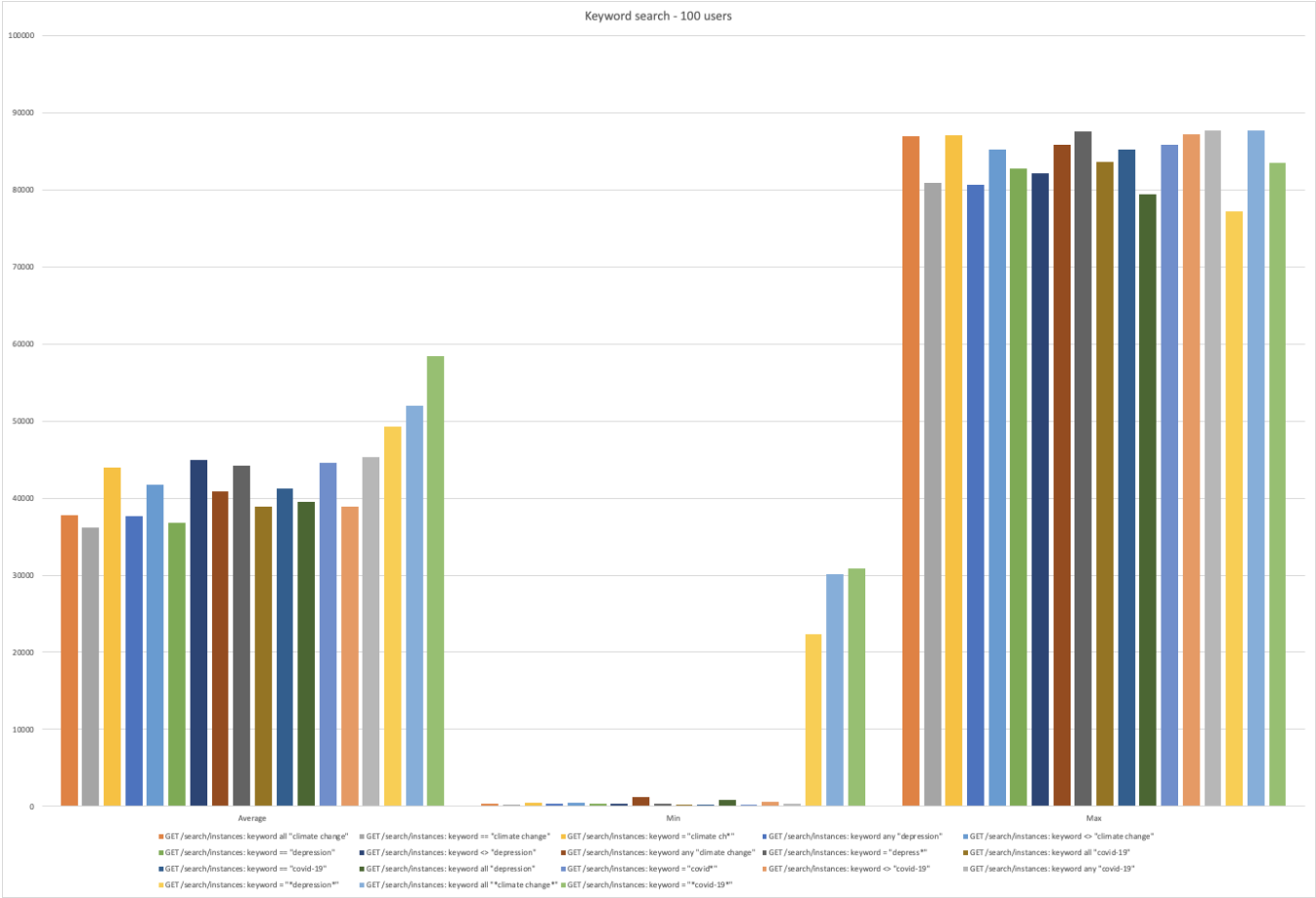


## Keyword search

| Label                                               | Samples | Average | Min  | Max   | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|-----------------------------------------------------|---------|---------|------|-------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: keyword all "climate change" | 32      | 37741   | 316  | 86932 | 26372,69  | 25.000% | 0,10651    | 2,54            | 0,05        |
| GET /search/instances: keyword == "climate change"  | 32      | 36185   | 277  | 80875 | 23114,14  | 25.000% | 0,10846    | 2,96            | 0,05        |
| GET /search/instances: keyword = "climate ch"       | 32      | 43925   | 518  | 87041 | 25747,59  | 31.250% | 0,10662    | 2,97            | 0,05        |
| GET /search/instances: keyword any "depression"     | 32      | 37665   | 302  | 80733 | 24448,55  | 43.750% | 0,10707    | 1,96            | 0,05        |
| GET /search/instances: keyword <> "climate change"  | 32      | 41745   | 435  | 85288 | 24852,72  | 37.500% | 0,11944    | 2,79            | 0,06        |
| GET /search/instances: keyword == "depression"      | 32      | 36775   | 323  | 82775 | 21368,9   | 28.125% | 0,10758    | 2,49            | 0,05        |
| GET /search/instances: keyword <> "depression"      | 31      | 44996   | 409  | 82167 | 23583,25  | 41.935% | 0,10685    | 2,27            | 0,05        |
| GET /search/instances: keyword any "climate change" | 32      | 40838   | 1272 | 85913 | 23145,04  | 34.375% | 0,10778    | 2,57            | 0,05        |
| GET /search/instances: keyword = "depress"          | 31      | 44168   | 358  | 87577 | 23803,19  | 41.935% | 0,10426    | 2,21            | 0,05        |

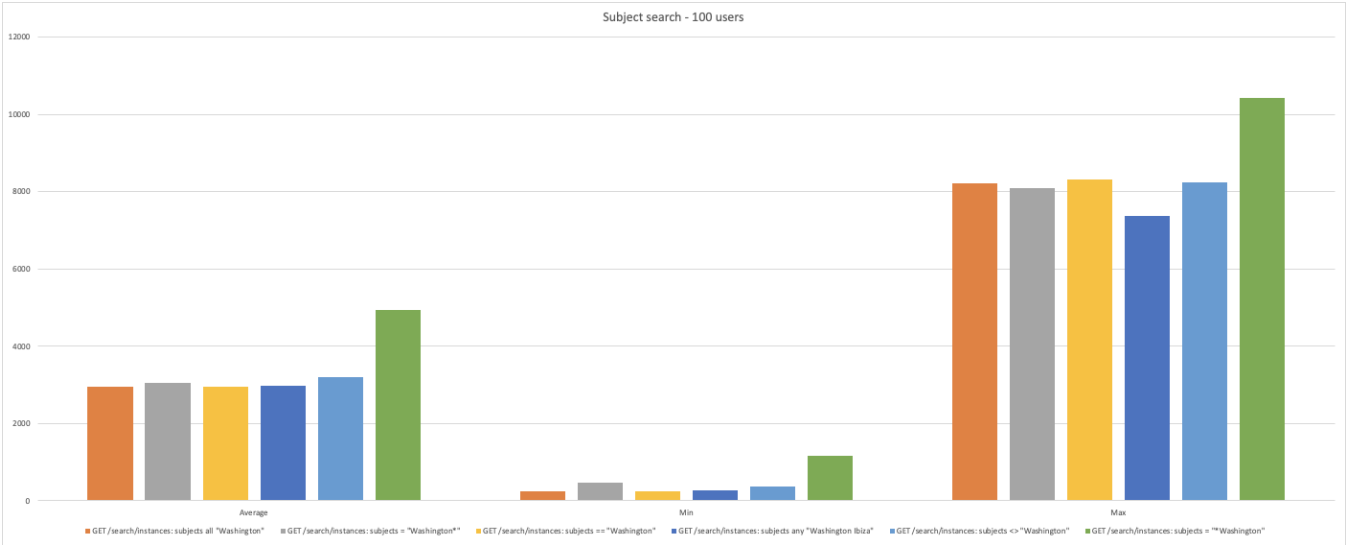
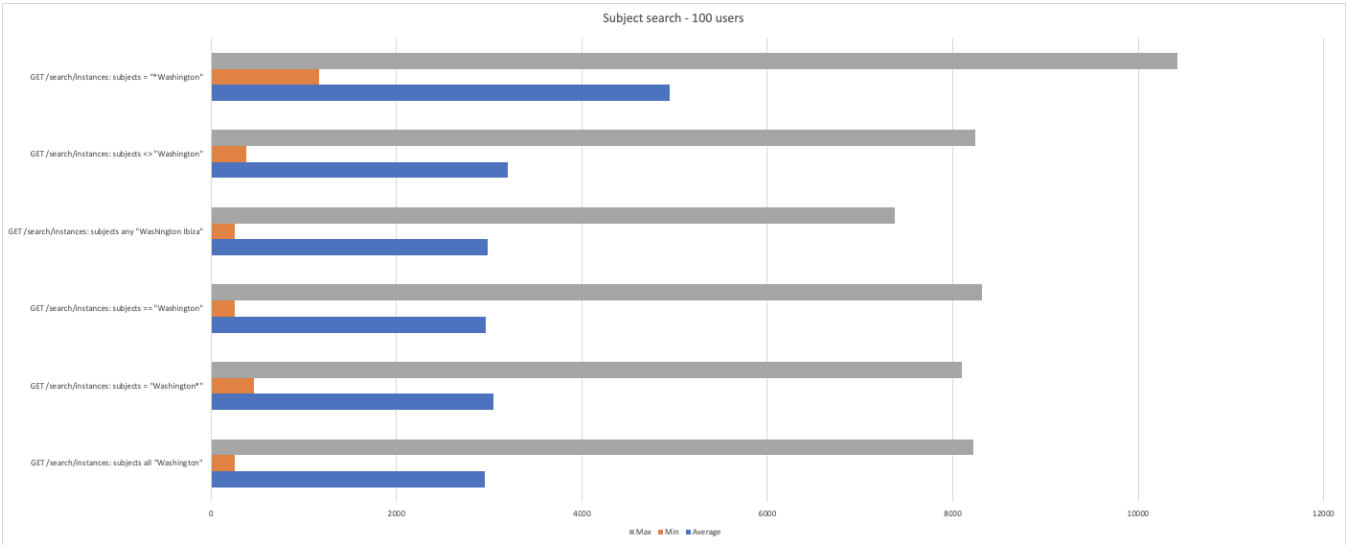
|                                                         |            |              |            |              |                 |                |                |              |             |
|---------------------------------------------------------|------------|--------------|------------|--------------|-----------------|----------------|----------------|--------------|-------------|
| GET /search/instances: keyword all "covid-19"           | 31         | 38894        | 273        | 83600        | 19502,84        | 25.806%        | 0,1136         | 0,04         | 0,06        |
| GET /search/instances: keyword == "covid-19"            | 31         | 41244        | 243        | 85238        | 21179,28        | 29.032%        | 0,11405        | 0,04         | 0,06        |
| GET /search/instances: keyword all "depression"         | 32         | 39507        | 818        | 79449        | 22616,29        | 31.250%        | 0,10712        | 2,15         | 0,05        |
| GET /search/instances: keyword = "covid*"               | 31         | 44584        | 254        | 85818        | 24512,77        | 32.258%        | 0,11772        | 0,04         | 0,06        |
| GET /search/instances: keyword <> "covid-19"            | 31         | 38905        | 556        | 87185        | 25677,61        | 38.710%        | 0,11577        | 2,64         | 0,06        |
| GET /search/instances: keyword any "covid-19"           | 31         | 45358        | 340        | 87676        | 24498,78        | 29.032%        | 0,10728        | 2,5          | 0,05        |
| GET /search/instances: keyword = "**depression**"       | 31         | 49345        | 22374      | 77190        | 15221,4         | 61.290%        | 0,11344        | 1,99         | 0,06        |
| GET /search/instances: keyword all "**climate change**" | 32         | 51967        | 30085      | 87703        | 15515,29        | 81.250%        | 0,10672        | 0,95         | 0,05        |
| GET /search/instances: keyword = "**covid-19**"         | 31         | 58444        | 30833      | 83574        | 14974,8         | 96.774%        | 0,10341        | 0,06         | 0,05        |
| <b>TOTAL</b>                                            | <b>568</b> | <b>42796</b> | <b>243</b> | <b>87703</b> | <b>23257,81</b> | <b>40.669%</b> | <b>1,87125</b> | <b>31,74</b> | <b>0,93</b> |





Subjects search

| Label                                                  | Samples | Average | Min  | Max   | Std. Dev. | Error % | Throughput | Received KB/sec | Sent KB/sec |
|--------------------------------------------------------|---------|---------|------|-------|-----------|---------|------------|-----------------|-------------|
| GET /search/instances: subjects all "Washington"       | 1104    | 2955    | 257  | 8221  | 1241,73   | 0.000%  | 4,54963    | 150,62          | 2,26        |
| GET /search/instances: subjects = "Washington"         | 1104    | 3043    | 464  | 8099  | 1198,93   | 0.000%  | 4,55369    | 191,62          | 2,26        |
| GET /search/instances: subjects == "Washington"        | 1103    | 2960    | 258  | 8311  | 1261,61   | 0.000%  | 4,567      | 151,2           | 2,28        |
| GET /search/instances: subjects any "Washington Ibiza" | 1103    | 2985    | 260  | 7372  | 1248,51   | 0.000%  | 4,5647     | 150,1           | 2,29        |
| GET /search/instances: subjects <> "Washington"        | 1103    | 3198    | 378  | 8242  | 1228,36   | 0.000%  | 4,57654    | 164,38          | 2,28        |
| GET /search/instances: subjects = "*"Washington"       | 1103    | 4950    | 1164 | 10426 | 1400,91   | 0.000%  | 4,54265    | 191,41          | 2,26        |
| TOTAL                                                  | 6621    | 3348    | 257  | 10426 | 1456,24   | 0.000%  | 27,03685   | 987,74          | 13,47       |



## Performance test results for 100 user

On average, search results fall between 400 and 1200 ms. Exceptions are requests in which a wildcard is present at the beginning or in the middle of the search request. There are **errors** for several kinds of the search requests.

| Type of search  | Average response time in ms | Errors |
|-----------------|-----------------------------|--------|
| Regular         | 3200                        | no     |
| Wildcard        | 25000                       | yes    |
| Wildcard prefix | 32000                       | yes    |

[100users\\_test\\_results.zip](#)