



Performance test report

Onteon vs Kubernetes

2022



Introduction

Containerization became a norm in modern application environments. To manage containers orchestration tools were developed. And Kubernetes became a standard tool.

In many projects the goals and deliverables are not directly bounded to containers and orchestration, but people think about using containers and Kubernetes by default.

There is always more than one way to achieve the goal.

And Onteon was born. A technology stack to develop, deploy and manage applications, containerized or native ones. It simplifies the architecture and management tasks, which results in lower costs of deployments and maintenance.

In many cases it may also improve performance.

Below you will find the results of the tests conducted recently, where we compared performance of distributed application in Onteon vs Kubernetes environment.



Summary

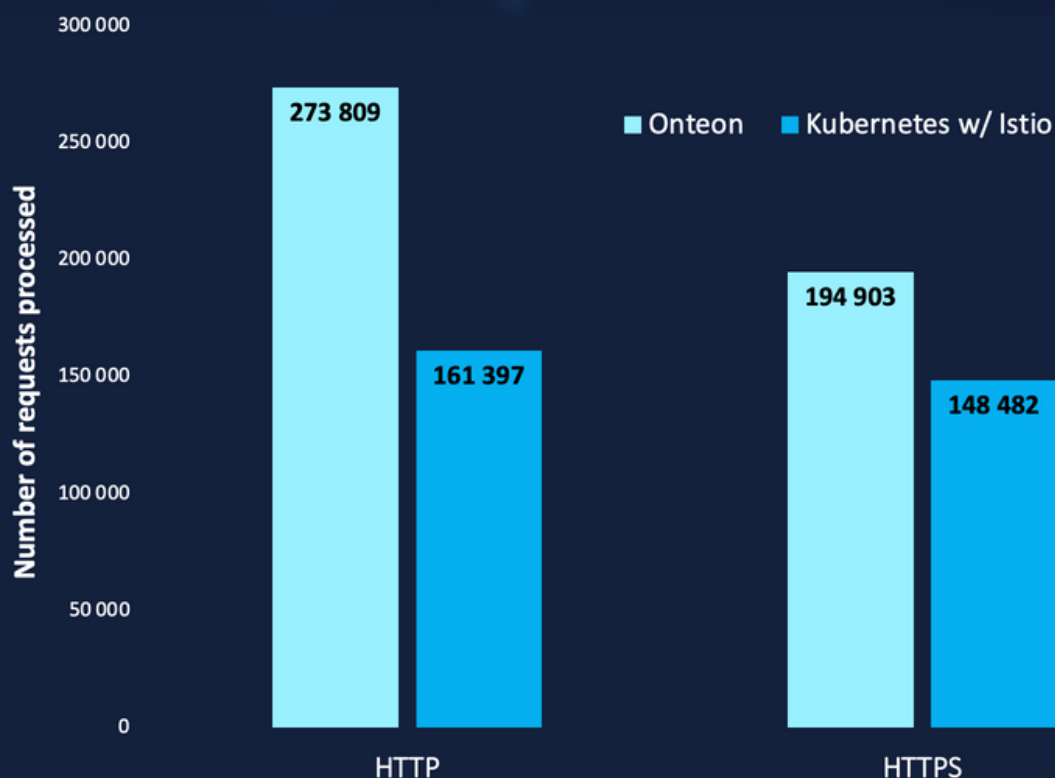
On April 20th and 24th 2022 the tests of Onteon and Kubernetes were conducted.

Tests were to calculate response time with the use of sample application and calculate number of requests in one of the tests.

Overall Onteon processed 69% more requests than Kubernetes in the same time, with much lower response time.

On average Onteon processed 68 452 requests per one vCPU, while Kubernetes 40 349. It also means that to process the same number of requests in the given period as Onteon, Kubernetes would need 3 vCPU more.

Onteon in this test used about 11% more energy. However while processing 69% more requests, it was more efficient, about 35% percent less power usage per single request.

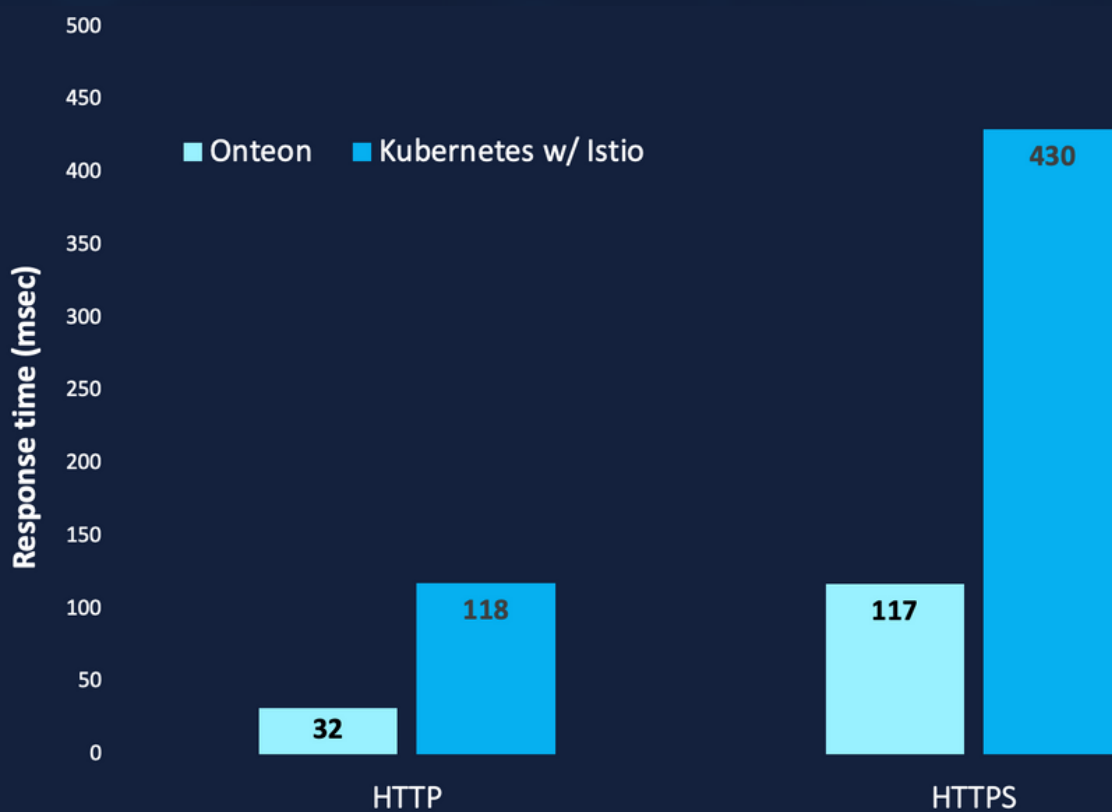




Summary

In second test with similar number of requests Onteon had 73% lower response time than Kubernetes.

It achieved this with about 9% lower power usage than Kubernetes.



Test 1 – HTTP – max requests

100 users were sending requests to application. Each user waited for the response from his request and sent another request after the response. It repeated for 10 minutes.

The response time was measured for 50th, 75th, 95th and 99th centile, as well as mean values.

Also the overall number of processed requests was measured.

| Response time in ms | | |
|---------------------|------------------|--------|
| | Kubernetes&Istio | Onteon |
| 50th | 377 | 302 |
| 75th | 524 | 328 |
| 95th | 763 | 380 |
| 99th | 964 | 473 |
| mean | 404 | 308 |
| st dev | 197 | 57 |
| max time | 1864 | 1627 |

Overall Onteon had greater performance. All response times were lower. At 99th centile Onteon had 49% lower response time than Kubernetes.

Mean response time for Onteon was 41% lower than Kubernetes with much lower standard deviation. Maximum response time was 50% lower for Onteon.

In this test during 10 minutes Onteon processed 273 809 requests while Kubernetes 161 397. It means Onteon processed 70% more requests in the same period.

To process 70% more requests Onteon used only 11% more energy.

Test 2 – HTTP – flat number of requests

200 users were sending requests to application and tried to reach and maintain the limit of 200 requests per second. It repeated for 10 minutes.

The response time was measured for 50th, 75th, 95th and 99th centile, as well as mean values.

| Response time in ms | | |
|---------------------|------------------|--------|
| | Kubernetes&Istio | Onteon |
| 50th | 52 | 23 |
| 75th | 93 | 27 |
| 95th | 230 | 49 |
| 99th | 430 | 117 |
| mean | 81 | 28 |
| st dev | 85 | 26 |
| max time | 1614 | 598 |

Overall Onteon had greater performance. All response times were lower. At 99th centile Onteon had 73% lower response time than Kubernetes.

Mean response time for Onteon was three times lower than Kubernetes with 62% lower standard deviation. Maximum response time was 30% lower for Onteon.

Above Onteon results were achieved with 10% less power usage than Kubernetes.

In the test period of 10 minutes Kubernetes processed 119 994 and Onteon processed 119 993 requests.

Test 1 – HTTPS – max requests

100 users were sending requests to application. Each user waited for the response from his request and sent another request after the response. It repeated for 10 minutes.

The response time was measured for 50th, 75th, 95th and 99th centile, as well as mean values.

Also the overall number of processed requests was measured.

| Response time in ms | | |
|---------------------|------------------|--------|
| | Kubernetes&Istio | Onteon |
| 50th | 343 | 209 |
| 75th | 490 | 265 |
| 95th | 717 | 365 |
| 99th | 893 | 456 |
| mean | 372 | 219 |
| st dev | 188 | 81 |
| max time | 1621 | 810 |

Overall Onteon had greater performance. All response times were lower. At 99th centile Onteon had 51% lower response time than Kubernetes.

Mean response time for Onteon was 24% lower than Kubernetes with much lower standard deviation. Maximum response time was 13% lower for Onteon.

In this test during 10 minutes Onteon processed 194 903 requests while Kubernetes 148 482. It means Onteon processed 31% more requests in the same period.

Test 2 – HTTPS – flat number of requests

200 users were sending requests to application and tried to reach and maintain the limit of 200 requests per second. It repeated for 10 minutes.

The response time was measured for 50th, 75th, 95th and 99th centile, as well as mean values.

| Response time in ms | | |
|---------------------|------------------|--------|
| | Kubernetes&Istio | Onteon |
| 50th | 24 | 8 |
| 75th | 30 | 9 |
| 95th | 66 | 16 |
| 99th | 118 | 32 |
| mean | 30 | 10 |
| st dev | 21 | 8 |
| max time | 488 | 342 |

Overall Onteon had greater performance. All response times were lower. At 99th centile Onteon had 73% lower response time than Kubernetes.

Mean response time for Onteon was 65% lower than Kubernetes with 69% lower standard deviation. Maximum response time was 63% lower for Onteon.

In the test period of 10 minutes Kubernetes processed 119 980 and Onteon processed 119 991 requests.

Test environment

Test architecture consisted of:

- one Master Node and two Worker Nodes (Kubernetes)
- one Onteon Control Center and two Node Managers (Onteon)

Master Node/Onteon Control Center – 8GB, 4 vCPU

Node 1 and Node 2 – 4GB, 2 vCPU each node

Because communication among application microservices was tested, for Kubernetes Istio was used. In Onteon case the built-in communication services were used.

Versions used during the test:

OS: Ubuntu 20.04.3 LTS

Kubernetes: 1.23

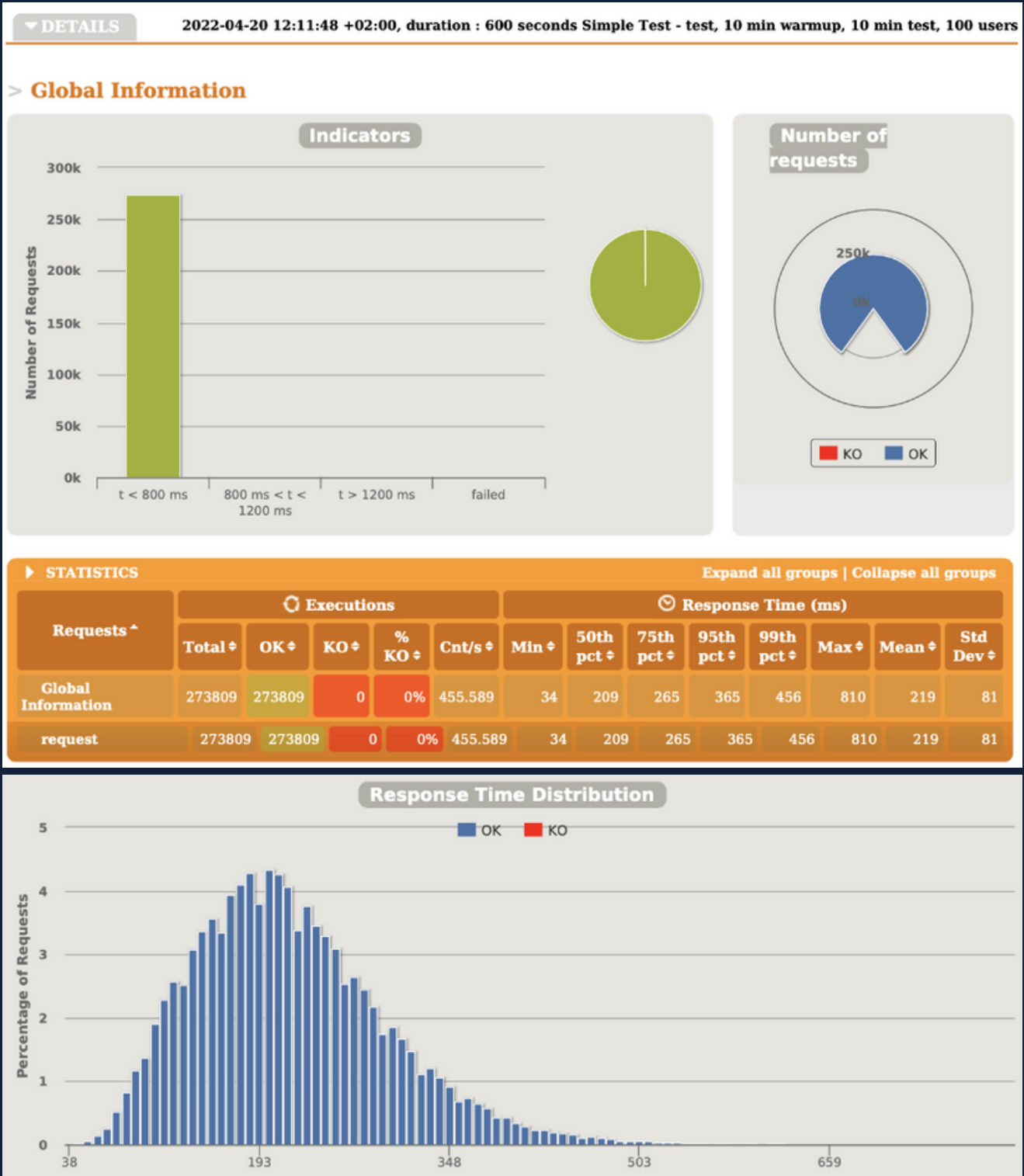
Istio: 1.13.3

Onteon: 1.2.0

Before any test run there was 10 minute warmup of the environment. Each test lasted 10 minutes.

Gatling results and power usage data

Test 1 – HTTP – max requests – Onteon



Gatling results and power usage data

Test 1 – HTTP – max requests - Kubernetes

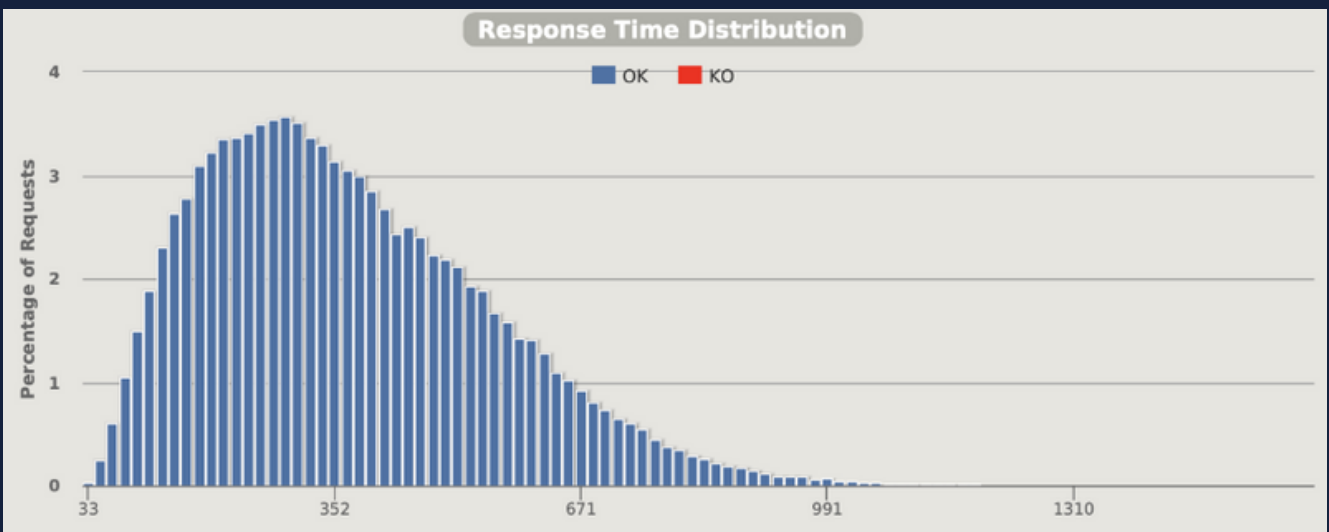
▼ DETAILS 2022-04-20 15:46:49 +02:00, duration : 600 seconds Simple Test - test, 10 min warmup, 10 min test, 100 users

> Global Information



▶ STATISTICS Expand all groups | Collapse all groups

| Requests ^ | Executions | | | | Response Time (ms) | | | | | | | | |
|--------------------|------------|--------|------|--------|--------------------|-------|------------|------------|------------|------------|-------|--------|-----------|
| | Total ↕ | OK ↕ | KO ↕ | % KO ↕ | Cnt/s ↕ | Min ↕ | 50th pct ↕ | 75th pct ↕ | 95th pct ↕ | 99th pct ↕ | Max ↕ | Mean ↕ | Std Dev ↕ |
| Global Information | 161397 | 161397 | 0 | 0% | 268.547 | 25 | 343 | 490 | 717 | 893 | 1621 | 372 | 188 |
| request | 161397 | 161397 | 0 | 0% | 268.547 | 25 | 343 | 490 | 717 | 893 | 1621 | 372 | 188 |



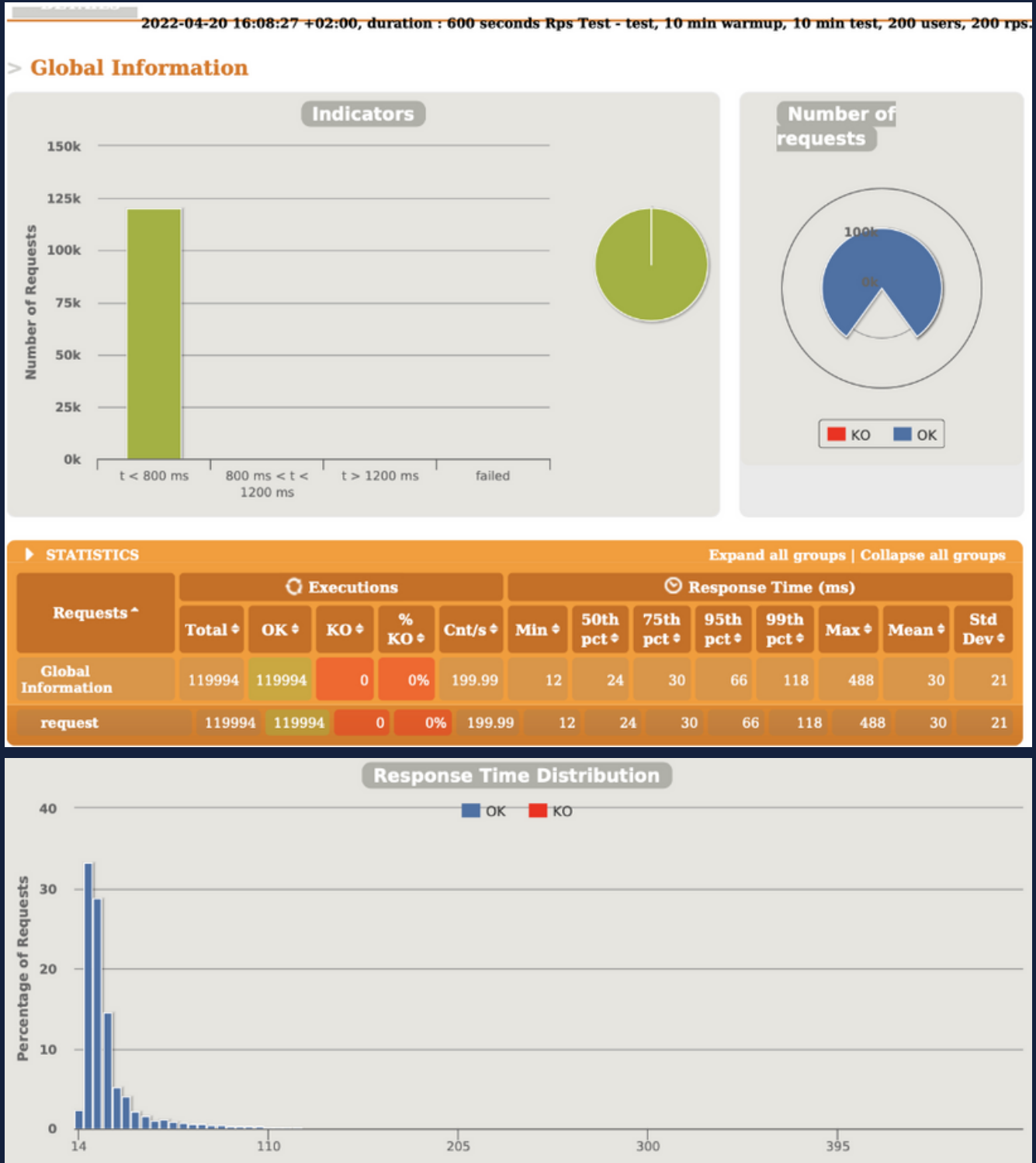
Gatling results and power usage data

Test 2 – HTTP – flat number of requests - Onteon



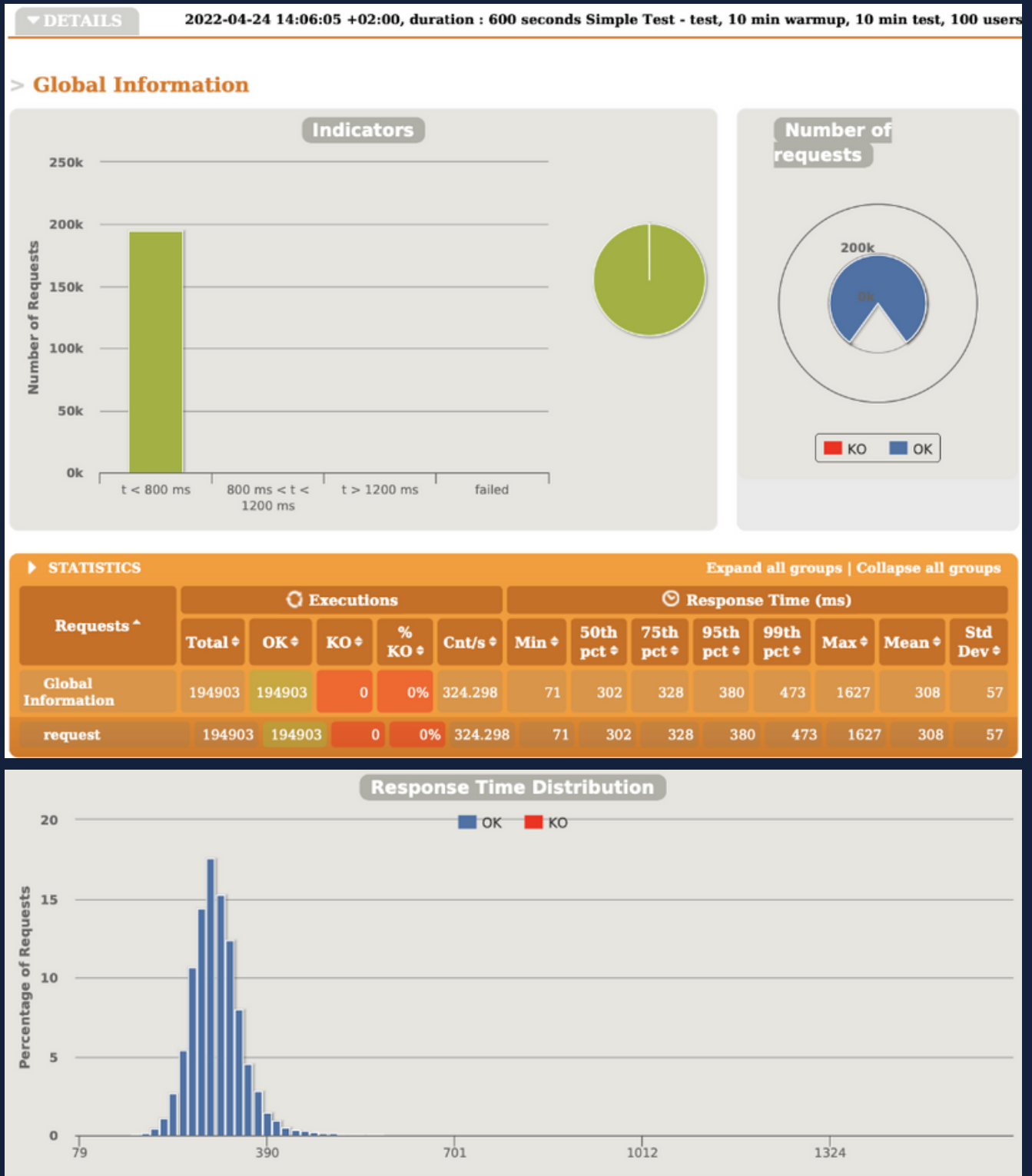
Gatling results and power usage data

Test 2 – HTTP – flat number of requests - Kubernetes



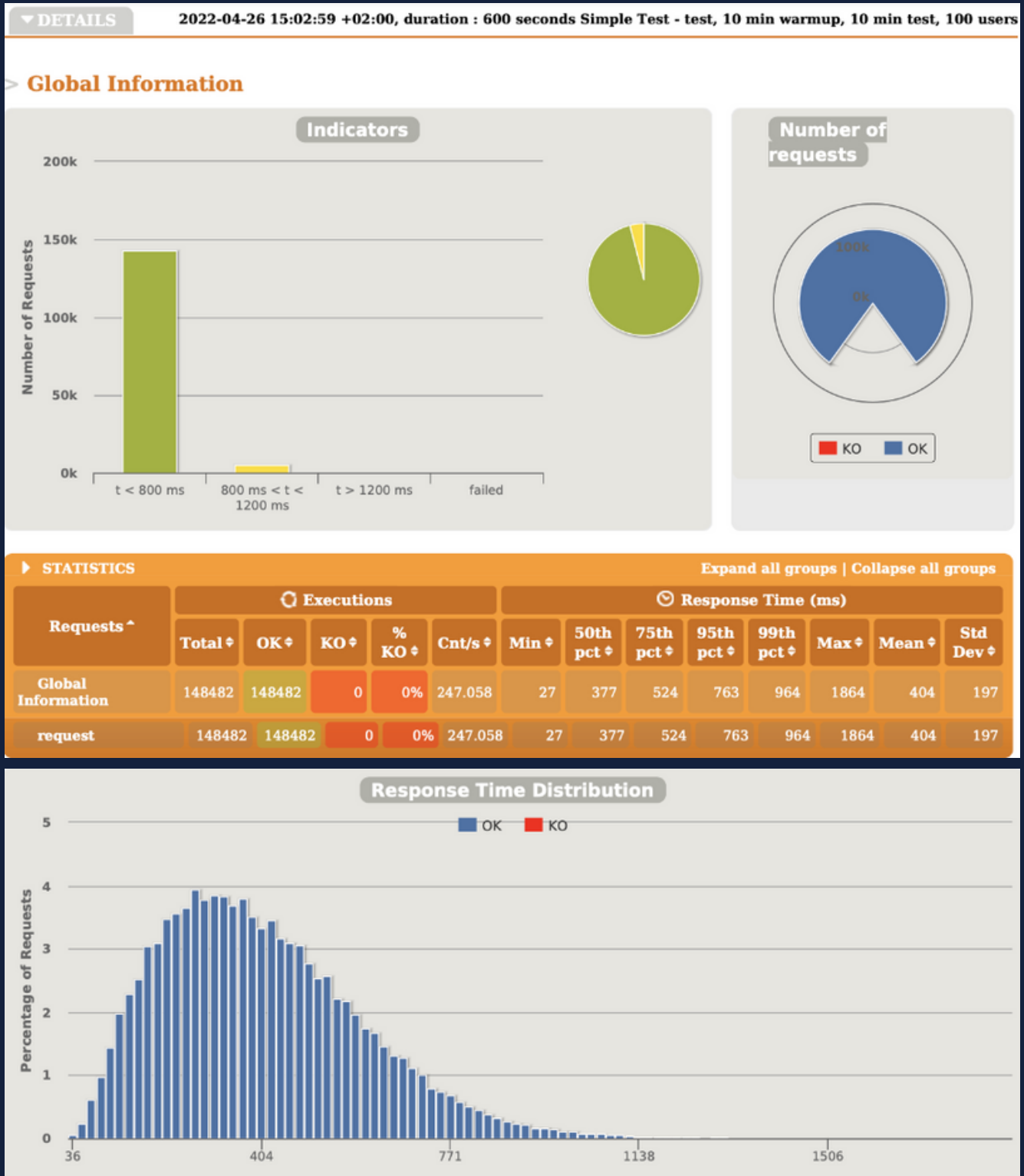
Gatling results and power usage data

Test 1 – HTTPS – max requests – Onteon



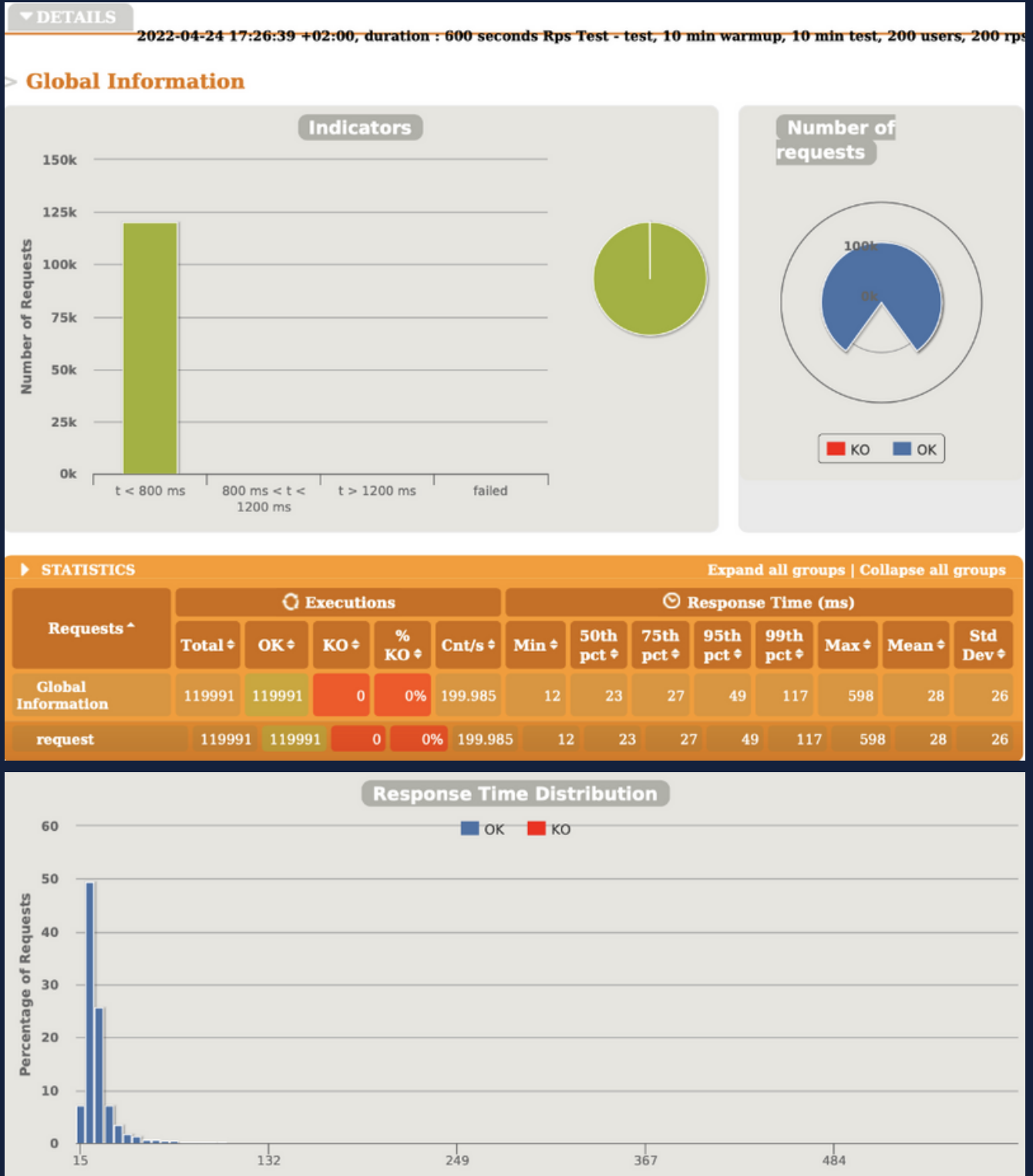
Gatling results and power usage data

Test 1 – HTTPS – max requests – Kubernetes



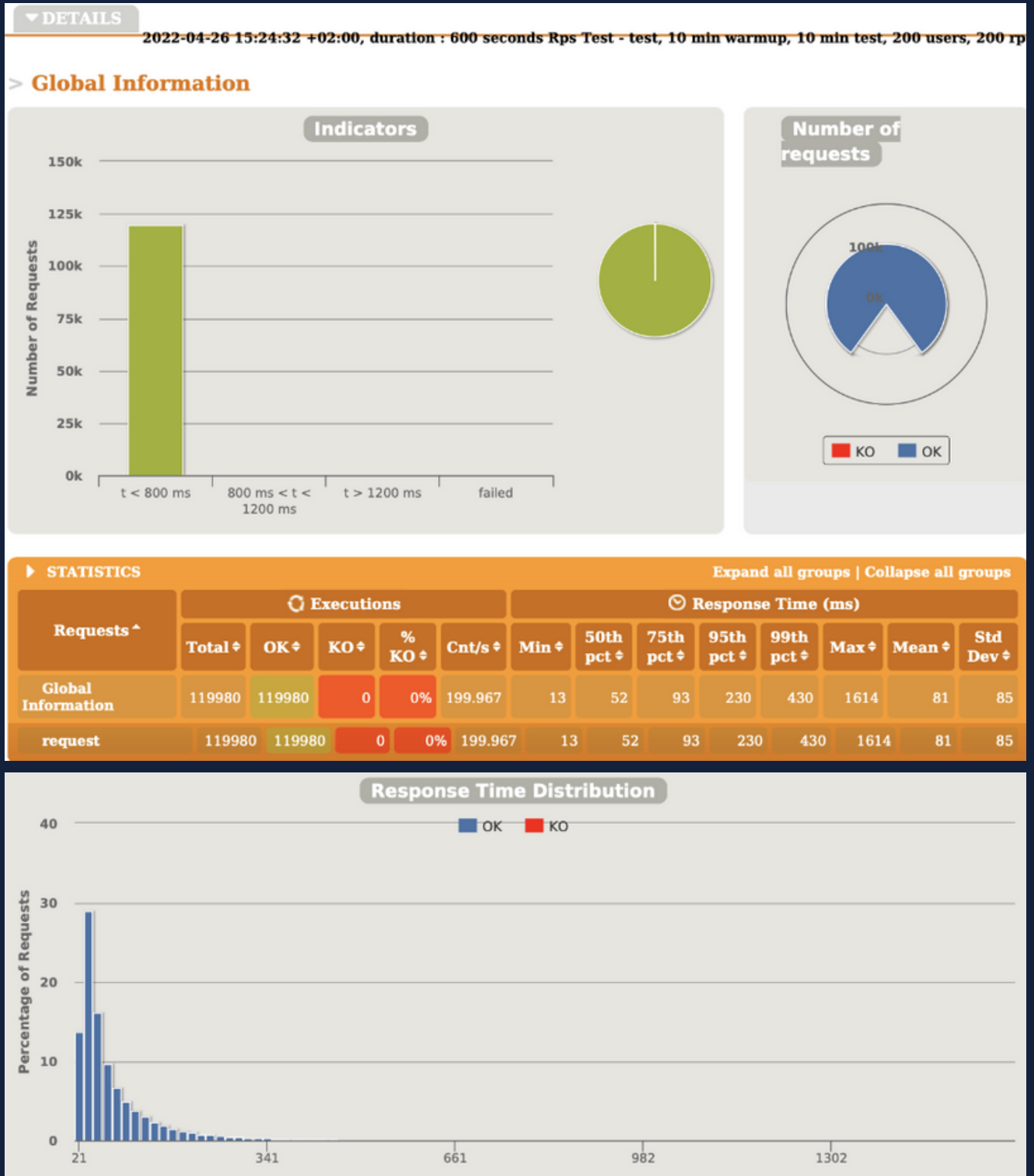
Gatling results and power usage data

Test 2 – HTTPS – flat number of requests - Onteon



Gatling results and power usage data

Test 2 – HTTPS – flat number of requests - Kubernetes



Test 1 – power use

| Onteon | | | | Kubernetes | | | |
|-----------|-------|-----------|-------|------------|-------|-----------|-------|
| Node 1 | | Node 2 | | Node 1 | | Node 2 | |
| Test time | Watts | Test time | Watts | Test time | Watts | Test time | Watts |
| 0 | 79,5 | 0 | 79,4 | 0 | 24,95 | 0 | 71,6 |
| 10 | 78,6 | 10 | 73,85 | 10 | 63,75 | 10 | 71,6 |
| 20 | 78,6 | 20 | 73,85 | 20 | 63,75 | 20 | 77,1 |
| 30 | 79,25 | 31 | 79,7 | 31 | 72,95 | 30 | 77,1 |
| 41 | 79,25 | 41 | 79,7 | 41 | 72,95 | 40 | 85,8 |
| 51 | 79,7 | 51 | 79,45 | 51 | 70,55 | 50 | 85,8 |
| 61 | 79,7 | 61 | 79,45 | 61 | 70,55 | 60 | 74,4 |
| 71 | 79,65 | 71 | 79,25 | 71 | 79,55 | 70 | 74,4 |
| 81 | 80,1 | 82 | 79,25 | 81 | 79,55 | 80 | 77,2 |
| 91 | 80,1 | 92 | 79,55 | 91 | 74,6 | 90 | 77,2 |
| 102 | 84,45 | 102 | 79,55 | 102 | 74,6 | 100 | 72,65 |
| 112 | 84,45 | 112 | 83,35 | 112 | 73,05 | 111 | 72,65 |
| 122 | 83,6 | 123 | 83,35 | 122 | 73,05 | 121 | 73,7 |
| 132 | 83,6 | 133 | 82,4 | 132 | 74,6 | 131 | 73,7 |
| 142 | 83,3 | 143 | 82,4 | 142 | 74,6 | 141 | 73,1 |
| 153 | 83,3 | 153 | 83,85 | 152 | 77,25 | 151 | 73,1 |
| 163 | 85,6 | 163 | 83,85 | 162 | 77,25 | 161 | 74,5 |
| 173 | 85,6 | 174 | 84,55 | 172 | 73,05 | 171 | 74,5 |
| 183 | 83,75 | 184 | 84,55 | 183 | 73,05 | 181 | 72,7 |
| 194 | 83,75 | 194 | 82,4 | 193 | 72,3 | 191 | 72,7 |
| 204 | 80,7 | 204 | 82,4 | 203 | 72,3 | 201 | 71,9 |
| 214 | 80,7 | 215 | 82,15 | 213 | 71,25 | 211 | 71,9 |
| 224 | 80,45 | 225 | 82,15 | 223 | 71,25 | 221 | 71,05 |
| 235 | 80,45 | 235 | 80,1 | 233 | 71,05 | 232 | 71,05 |
| 245 | 79,8 | 245 | 80,1 | 243 | 71,05 | 242 | 70,8 |
| 255 | 79,8 | 256 | 79,7 | 254 | 70,65 | 252 | 70,8 |
| 265 | 79,35 | 266 | 79,7 | 264 | 70,65 | 262 | 70,75 |
| 276 | 79,35 | 276 | 79,25 | 274 | 70,75 | 272 | 70,75 |
| 286 | 79,45 | 286 | 79,25 | 284 | 70,75 | 282 | 70,45 |
| 296 | 79,45 | 297 | 79,45 | 294 | 70,55 | 292 | 70,45 |
| 306 | 79,65 | 307 | 79,45 | 304 | 70,6 | 302 | 70,7 |
| 317 | 79,65 | 317 | 79,8 | 315 | 70,6 | 312 | 70,7 |
| 327 | 79,6 | 327 | 79,8 | 325 | 70,45 | 322 | 70,4 |
| 337 | 79,6 | 338 | 79,7 | 335 | 70,45 | 332 | 70,4 |
| 347 | 80,4 | 348 | 79,7 | 345 | 70,35 | 342 | 70,6 |
| 358 | 80,4 | 358 | 79,95 | 355 | 70,35 | 353 | 70,6 |
| 368 | 79,4 | 368 | 79,95 | 365 | 72,05 | 363 | 70,95 |
| 378 | 79,4 | 379 | 79,4 | 375 | 72,05 | 373 | 70,95 |
| 388 | 80,1 | 389 | 79,4 | 385 | 71,05 | 383 | 71,5 |
| 398 | 80,1 | 399 | 80 | 396 | 71,05 | 393 | 71,5 |
| 408 | 79,3 | 409 | 80 | 406 | 71,25 | 403 | 71,75 |
| 419 | 79,3 | 420 | 79,6 | 416 | 71,25 | 413 | 71,75 |
| 429 | 79,85 | 430 | 79,6 | 426 | 70,55 | 423 | 70,85 |
| 439 | 79,85 | 440 | 79,75 | 436 | 70,55 | 433 | 70,85 |
| 449 | 79,55 | 450 | 80,7 | 446 | 70,3 | 443 | 70,25 |
| 459 | 79,55 | 460 | 80,7 | 456 | 70,3 | 453 | 70,25 |
| 470 | 79,85 | 471 | 79,4 | 467 | 70,9 | 464 | 69,25 |
| 480 | 79,85 | 481 | 79,4 | 477 | 70,9 | 474 | 69,25 |
| 490 | 80,9 | 491 | 81,4 | 487 | 70,55 | 484 | 70,6 |
| 500 | 80,9 | 501 | 81,4 | 497 | 70,55 | 494 | 70,6 |
| 511 | 82,55 | 511 | 79,4 | 507 | 70 | 504 | 70,3 |
| 521 | 82,55 | 522 | 79,4 | 517 | 70 | 514 | 73,8 |
| 531 | 75,6 | 532 | 74,8 | 527 | 72,3 | 524 | 73,8 |
| 541 | 75,6 | 542 | 74,8 | 537 | 72,3 | 534 | 71,75 |
| 552 | 73,6 | 552 | 72,4 | 548 | 71,6 | 544 | 71,75 |
| 562 | 73,6 | 563 | 72,4 | 558 | 71,6 | 554 | 71,2 |
| 572 | 72,9 | 573 | 72,3 | 568 | 71,15 | 564 | 71,2 |
| 583 | 72,9 | 583 | 72,3 | 578 | 71,15 | 574 | 71,25 |
| 593 | 71,7 | 593 | 74 | 588 | 71,35 | 585 | 71,25 |
| 604 | 71,7 | 604 | 74 | 598 | 71,35 | 595 | 71,4 |

Test 2 – power use

| Onteon | | | | Kubernetes | | | |
|-----------|--------|-----------|-------|------------|-------|-----------|-------|
| Node 1 | | Node 2 | | Node 1 | | Node 2 | |
| Test time | Watts | Test time | Watts | Test time | Watts | Test time | Watts |
| 0 | 57,8 | 0 | 66,35 | 0 | 65,2 | 0 | 65,95 |
| 10 | 57,8 | 10 | 66,35 | 10 | 65,2 | 10 | 64,2 |
| 20 | 100,95 | 20 | 66,9 | 20 | 74,3 | 20 | 64,2 |
| 31 | 100,95 | 31 | 66,9 | 31 | 74,3 | 30 | 75,35 |
| 41 | 66,35 | 41 | 65,35 | 41 | 71,2 | 40 | 75,35 |
| 51 | 66,35 | 51 | 65,35 | 51 | 71,2 | 50 | 70,15 |
| 61 | 65,2 | 61 | 64,25 | 61 | 68,2 | 61 | 70,15 |
| 71 | 65,2 | 71 | 64,25 | 71 | 68,2 | 71 | 68,05 |
| 81 | 62,75 | 81 | 62,4 | 81 | 67,95 | 81 | 68,05 |
| 92 | 62,75 | 92 | 62,4 | 91 | 67,95 | 91 | 68,1 |
| 102 | 61,65 | 102 | 60,95 | 101 | 66,85 | 101 | 68,1 |
| 112 | 61,65 | 112 | 60,95 | 111 | 66,85 | 111 | 66,6 |
| 122 | 61,15 | 122 | 60,95 | 122 | 66,15 | 121 | 66,6 |
| 132 | 61,15 | 132 | 60,95 | 132 | 66,15 | 131 | 65,9 |
| 142 | 60,65 | 142 | 60,5 | 142 | 65,8 | 141 | 65,9 |
| 152 | 60,65 | 153 | 60,5 | 152 | 65,8 | 151 | 65,7 |
| 163 | 60,65 | 163 | 60,5 | 162 | 65,85 | 161 | 65,7 |
| 173 | 60,65 | 173 | 60,5 | 172 | 65,85 | 172 | 65,6 |
| 183 | 60,35 | 183 | 60,35 | 182 | 65,65 | 182 | 65,6 |
| 193 | 60,35 | 193 | 60,35 | 192 | 65,65 | 192 | 66,3 |
| 203 | 60,7 | 203 | 60,65 | 202 | 66,05 | 202 | 66,3 |
| 213 | 60,7 | 214 | 60,65 | 212 | 66,05 | 212 | 65,9 |
| 224 | 60,8 | 224 | 60,75 | 223 | 65,5 | 222 | 65,9 |
| 234 | 60,8 | 234 | 60,75 | 233 | 65,5 | 232 | 66,15 |
| 244 | 60,7 | 244 | 60,85 | 243 | 65,95 | 242 | 66,15 |
| 254 | 60,7 | 254 | 60,85 | 253 | 65,95 | 252 | 65,55 |
| 264 | 60,4 | 264 | 60,6 | 263 | 65,6 | 262 | 65,55 |
| 274 | 60,4 | 275 | 60,6 | 273 | 65,6 | 272 | 65,85 |
| 284 | 61,15 | 285 | 60,7 | 283 | 65,8 | 282 | 65,85 |
| 295 | 61,15 | 295 | 60,7 | 293 | 65,8 | 293 | 65,75 |
| 315 | 60,7 | 315 | 60,5 | 314 | 65,15 | 313 | 65,85 |
| 325 | 61,05 | 325 | 60,9 | 324 | 66 | 323 | 65,85 |
| 335 | 61,05 | 336 | 60,9 | 334 | 66 | 333 | 65,7 |
| 346 | 61,25 | 346 | 60,7 | 344 | 65,9 | 343 | 65,7 |
| 356 | 61,25 | 356 | 60,7 | 354 | 65,9 | 353 | 73,8 |
| 366 | 60,55 | 366 | 60,45 | 364 | 74,15 | 363 | 73,8 |
| 376 | 60,55 | 376 | 60,45 | 374 | 74,15 | 373 | 76,5 |
| 386 | 60,65 | 386 | 60,65 | 385 | 71,9 | 383 | 76,5 |
| 396 | 60,65 | 397 | 60,65 | 395 | 71,9 | 393 | 68,85 |
| 407 | 60,9 | 407 | 60,3 | 405 | 67,15 | 403 | 68,85 |
| 417 | 61,05 | 417 | 60,3 | 415 | 67,15 | 414 | 66,3 |
| 427 | 61,05 | 427 | 60,9 | 425 | 69,1 | 424 | 66,3 |
| 437 | 60,8 | 437 | 60,9 | 435 | 69,1 | 434 | 69,65 |
| 447 | 60,8 | 447 | 60,65 | 445 | 67,9 | 444 | 69,65 |
| 457 | 60,6 | 457 | 60,65 | 455 | 67,9 | 454 | 66,55 |
| 468 | 60,6 | 468 | 60,55 | 465 | 67,65 | 464 | 66,55 |
| 478 | 60,5 | 478 | 60,55 | 476 | 67,65 | 474 | 67,85 |
| 488 | 60,5 | 488 | 60,25 | 486 | 67,15 | 484 | 67,85 |
| 498 | 60,55 | 498 | 60,25 | 496 | 67,15 | 494 | 68,8 |
| 508 | 60,55 | 508 | 60,55 | 506 | 67,5 | 504 | 68,8 |
| 518 | 61,9 | 518 | 60,55 | 516 | 67,5 | 514 | 66,65 |
| 529 | 61,9 | 529 | 61,05 | 526 | 66,6 | 524 | 66,65 |
| 539 | 60,85 | 539 | 61,05 | 536 | 66,6 | 535 | 66,1 |
| 549 | 60,85 | 549 | 60,8 | 546 | 66,4 | 545 | 66,1 |
| 559 | 60,9 | 559 | 60,8 | 557 | 66,4 | 555 | 67,2 |
| 569 | 60,9 | 569 | 60,9 | 567 | 68,3 | 565 | 67,2 |
| 579 | 60,7 | 579 | 60,9 | 577 | 68,3 | 575 | 67,15 |
| 590 | 60,7 | 590 | 60,4 | 587 | 66,5 | 585 | 67,15 |
| 600 | 61,3 | 600 | 60,4 | 597 | 67,85 | 595 | 66,25 |
| 610 | 61,3 | 610 | 61 | 607 | 67,85 | 605 | 66,25 |