NOVA SCHOOL OF
SCIENCE & TECHNOLOGY

SCC Report

Azure Tukano – 2024/2025

Project and Report done by:

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Introduction

In this project, we had the objective to transport a web application app called ‘Tukano’ to leverage the various tools available in cloud at Microsoft Azure’s platform. To do so, we changed some key factors of the application like, Blob Storage, Databases, and Caches so that the application could be run totally on Azure Cloud Provider Platform.

For this project, we did everything that was required for the ‘Base Solution’ evaluation that counts to 15 points of the grade. We did not use our own Artillery tests and tested the application functionalities using the professors given Artillery tests.

The application was tested internally (using Tomcat) and deployed on the Cloud (using Azure). To test the application, it is necessary that you change the ‘azurekeys-region.props’ file to have the correct connection, just like the ‘hibernate.cfg.xml’ file to have the correct PostgreSQL connection string and password. To test different databases and to turn On and Off the cache, use the boolean switch present in ‘utils.DB’.

A more detailed explanation of each one of the services implemented can be found in the following sections.

Azure Blob Containers

The first service implemented in the application was the Blob Containers Service. In this section, we altered the code found in ‘tukano.impl.storage.FileSystemStorage’ to use the ‘tukano.impl.storage.CloudBlobIO’ to upload and download shorts from Azure Containers. Doing so, instead of storing the blobs for each short in an internal file system, each blob is uploaded to a Blob Azure Container and all operations are done in cloud.

When we open the Azure Cloud Container, we can see that each user of the system has an associated folder, where, inside each folder, there are the blobs associated with each short of the user.

Azure Cosmos DB

In our version of the project, it is possible to use 2 different databases to interact with our program, those being CosmosDB PostgreSQL using Hibernate, and CosmosDB with NoSQL. To switch from each version, use the boolean switch present in 'utils.DB'.

Hibernate & PostgreSQL

The first version of the database implemented is PostegreSQL using Hibernate to connect to a CosmosDB. In this version, not much was needed to change for the code to work, besides changing the 'hibernate.cfg.xml' to connect to a CosmosDB and to change the table name of 'Users' to 'AppUsers' to not cause name conflicts. After that, all 'Users', 'Shorts', Likes' and 'Following' are now stored in CosmosDB and can be accessed through Azure Cosmos Services.

CosmosDB & NoSQL

The second version of the database is NoSQL using CosmosDB. For this version to work, a connection with an Azure Client is created by the code and each class ('User', 'Short', …) is stored in their respective containers. For this version of the code to work, a lot of changes were required in the code, such as, modifying each database class to contain a field called 'id', and changing various portions of the code in 'JavaShorts' and 'JavaUsers' to execute correct query methods to the Cosmos Database. The only function that currently doesn't work with this form of database is the getFeed() method as 'UNION' operations don't work with NoSQL. The rest of the other endpoints were tested and are functional.

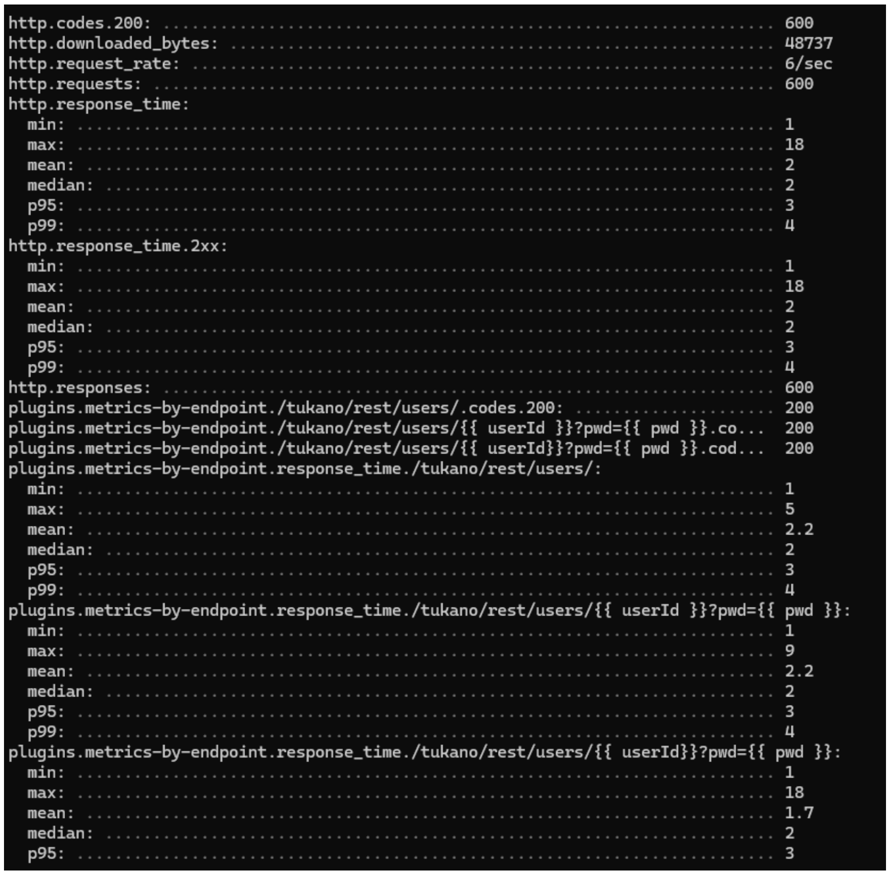
Redis Cache

Finally, the last implemented feature is Redis Cache. This type of cache is implemented both in NoSQL and PostgreSQL and can be activated and deactivated using the boolean switch present in 'utils.DB'. For each one of the implemented databases, a new version/class that adopts the new cache system was created, where each time an object is inserted or updated, that object is inserted/updated into the cache with a default 100 second expiration time. Every time an object is retrieved, if that object exists in Redis cache, it is retrieved faster as it is not necessary to query the database. If an object doesn't exist in cache, it is retrieved from the database and updated in cache. When an object is deleted, it is also deleted from cache. In this version of the cache, the only classes that are stored are ‘Users’ and ‘Shorts’.

Analise de Performance

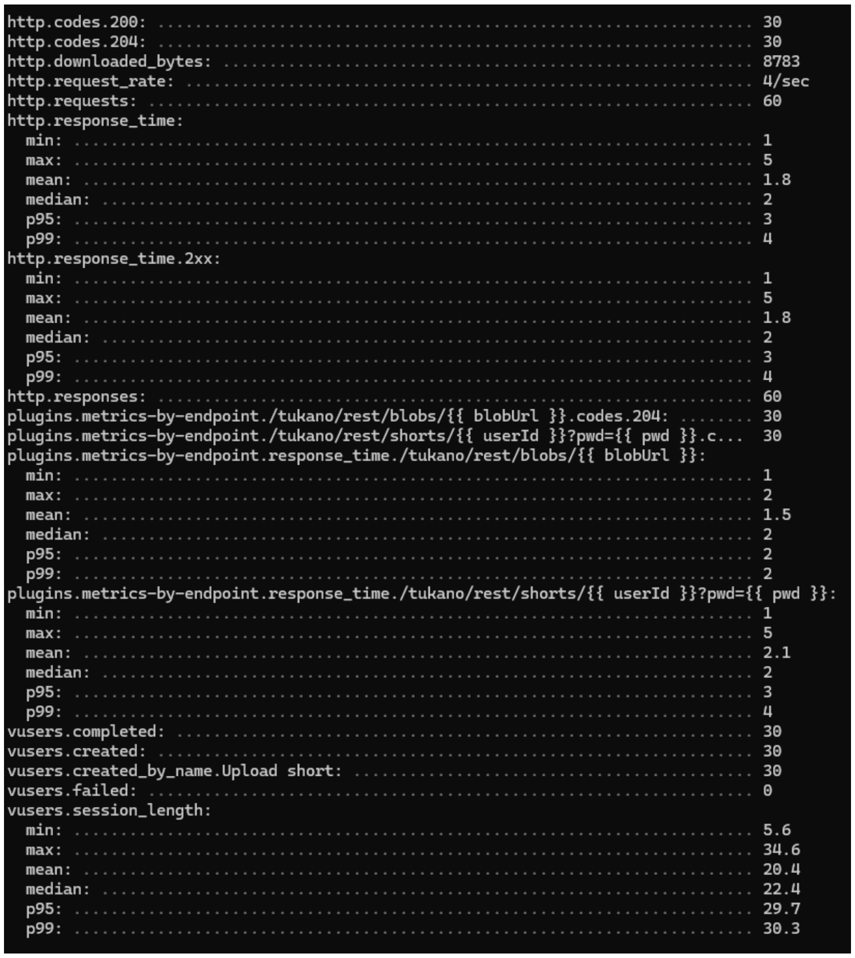
Tukano Base

The following images represent some prints taken from the Base Tukano application that were locally tested so that we can later compare them to other tests of the full application:



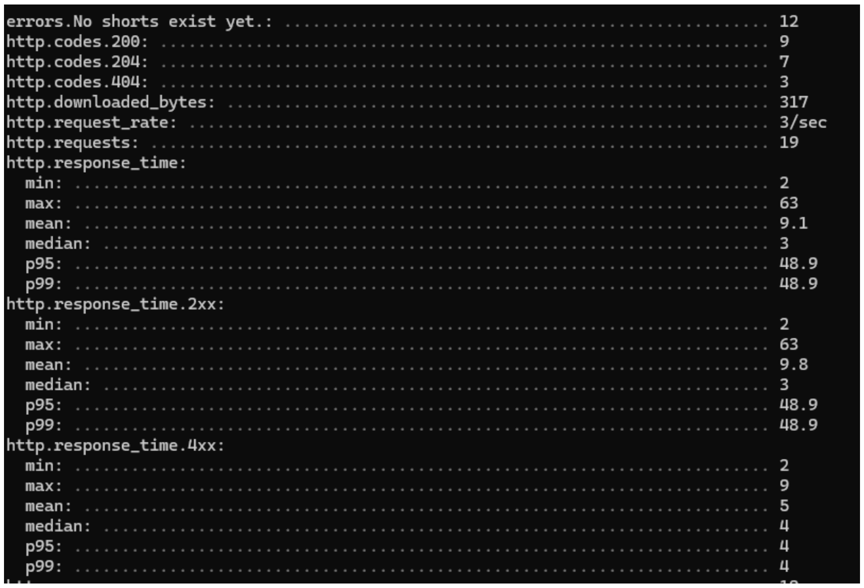
```
http.codes.200: ................................................................ 600
http.downloaded_bytes: ......................................................... 48737
http.request_rate: ............................................................. 6/sec
http.requests: ................................................................. 600
http.response_time:
  min: ......................................................................... 1
  max: ......................................................................... 18
  mean: ........................................................................ 2
  median: ...................................................................... 2
  p95: ......................................................................... 3
  p99: ......................................................................... 4
http.response_time.2xx:
  min: ......................................................................... 1
  max: ......................................................................... 18
  mean: ........................................................................ 2
  median: ...................................................................... 2
  p95: ......................................................................... 3
  p99: ......................................................................... 4
http.responses: ................................................................ 600
plugins.metrics-by-endpoint./tukano/rest/users/.codes.200: ..................... 200
plugins.metrics-by-endpoint./tukano/rest/users/{{ userId }}?pwd={{ pwd }}.co...  200
plugins.metrics-by-endpoint./tukano/rest/users/{{ userId}}?pwd={{ pwd }}.cod...  200
plugins.metrics-by-endpoint.response_time./tukano/rest/users/:
  min: ......................................................................... 1
  max: ......................................................................... 5
  mean: ........................................................................ 2.2
  median: ...................................................................... 2
  p95: ......................................................................... 3
  p99: ......................................................................... 4
plugins.metrics-by-endpoint.response_time./tukano/rest/users/{{ userId }}?pwd={{ pwd }}:
  min: ......................................................................... 1
  max: ......................................................................... 9
  mean: ........................................................................ 2.2
  median: ...................................................................... 2
  p95: ......................................................................... 3
  p99: ......................................................................... 4
plugins.metrics-by-endpoint.response_time./tukano/rest/users/{{ userId}}?pwd={{ pwd }}:
  min: ......................................................................... 1
  max: ......................................................................... 18
  mean: ........................................................................ 1.7
  median: ...................................................................... 2
  p95: ......................................................................... 3
```

Fig 1. Artillery test ‘user_register.yaml’ run with the base tukano app



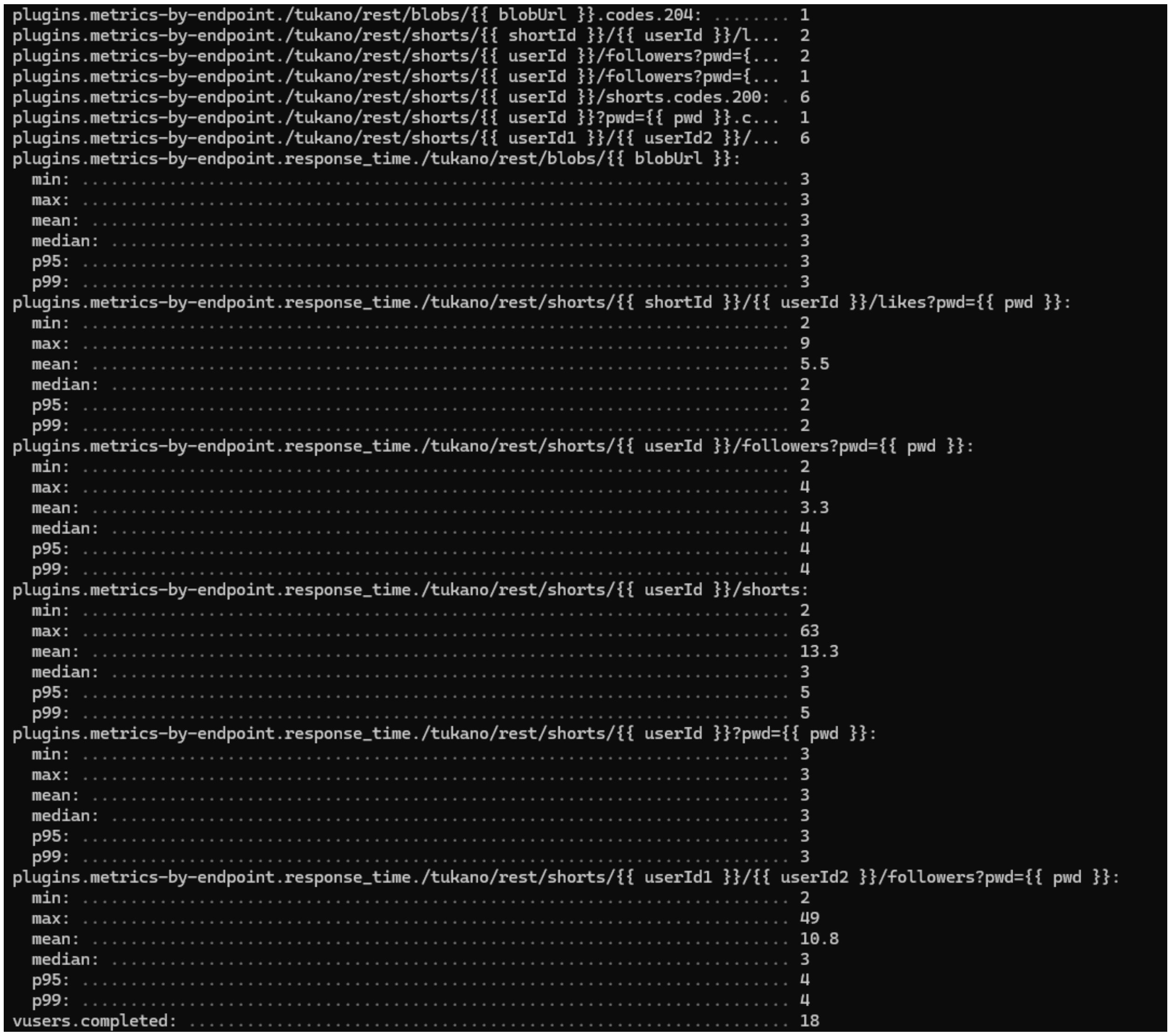
```
http.codes.200: .............................................................. 30
http.codes.204: .............................................................. 30
http.downloaded_bytes: ....................................................... 8783
http.request_rate: ........................................................... 4/sec
http.requests: ............................................................... 60
http.response_time:
  min: ....................................................................... 1
  max: ....................................................................... 5
  mean: ...................................................................... 1.8
  median: .................................................................... 2
  p95: ....................................................................... 3
  p99: ....................................................................... 4
http.response_time.2xx:
  min: ....................................................................... 1
  max: ....................................................................... 5
  mean: ...................................................................... 1.8
  median: .................................................................... 2
  p95: ....................................................................... 3
  p99: ....................................................................... 4
http.responses: .............................................................. 60
plugins.metrics-by-endpoint./tukano/rest/blobs/{{ blobUrl }}.codes.204: ........ 30
plugins.metrics-by-endpoint./tukano/rest/shorts/{{ userId }}?pwd={{ pwd }}.c...  30
plugins.metrics-by-endpoint.response_time./tukano/rest/blobs/{{ blobUrl }}:
  min: ....................................................................... 1
  max: ....................................................................... 2
  mean: ...................................................................... 1.5
  median: .................................................................... 2
  p95: ....................................................................... 2
  p99: ....................................................................... 2
plugins.metrics-by-endpoint.response_time./tukano/rest/shorts/{{ userId }}?pwd={{ pwd }}:
  min: ....................................................................... 1
  max: ....................................................................... 5
  mean: ...................................................................... 2.1
  median: .................................................................... 2
  p95: ....................................................................... 3
  p99: ....................................................................... 4
vusers.completed: ............................................................ 30
vusers.created: .............................................................. 30
vusers.created_by_name.Upload short: ......................................... 30
vusers.failed: ............................................................... 0
vusers.session_length:
  min: ....................................................................... 5.6
  max: ....................................................................... 34.6
  mean: ...................................................................... 20.4
  median: .................................................................... 22.4
  p95: ....................................................................... 29.7
  p99: ....................................................................... 30.3
```

Fig 2. Artillery test ‘upload_shorts.yaml’ for Base Tukano



```
errors.No shorts exist yet.: ..................................................... 12
http.codes.200: .................................................................. 9
http.codes.204: .................................................................. 7
http.codes.404: .................................................................. 3
http.downloaded_bytes: ........................................................... 317
http.request_rate: ............................................................... 3/sec
http.requests: ................................................................... 19
http.response_time:
  min: ........................................................................... 2
  max: ........................................................................... 63
  mean: .......................................................................... 9.1
  median: ........................................................................ 3
  p95: ........................................................................... 48.9
  p99: ........................................................................... 48.9
http.response_time.2xx:
  min: ........................................................................... 2
  max: ........................................................................... 63
  mean: .......................................................................... 9.8
  median: ........................................................................ 3
  p95: ........................................................................... 48.9
  p99: ........................................................................... 48.9
http.response_time.4xx:
  min: ........................................................................... 2
  max: ........................................................................... 9
  mean: .......................................................................... 5
  median: ........................................................................ 4
  p95: ........................................................................... 4
  p99: ........................................................................... 4
```

Fig 3. Artillery test ‘realistic_flow.yaml’ for Base Tukano Response Time



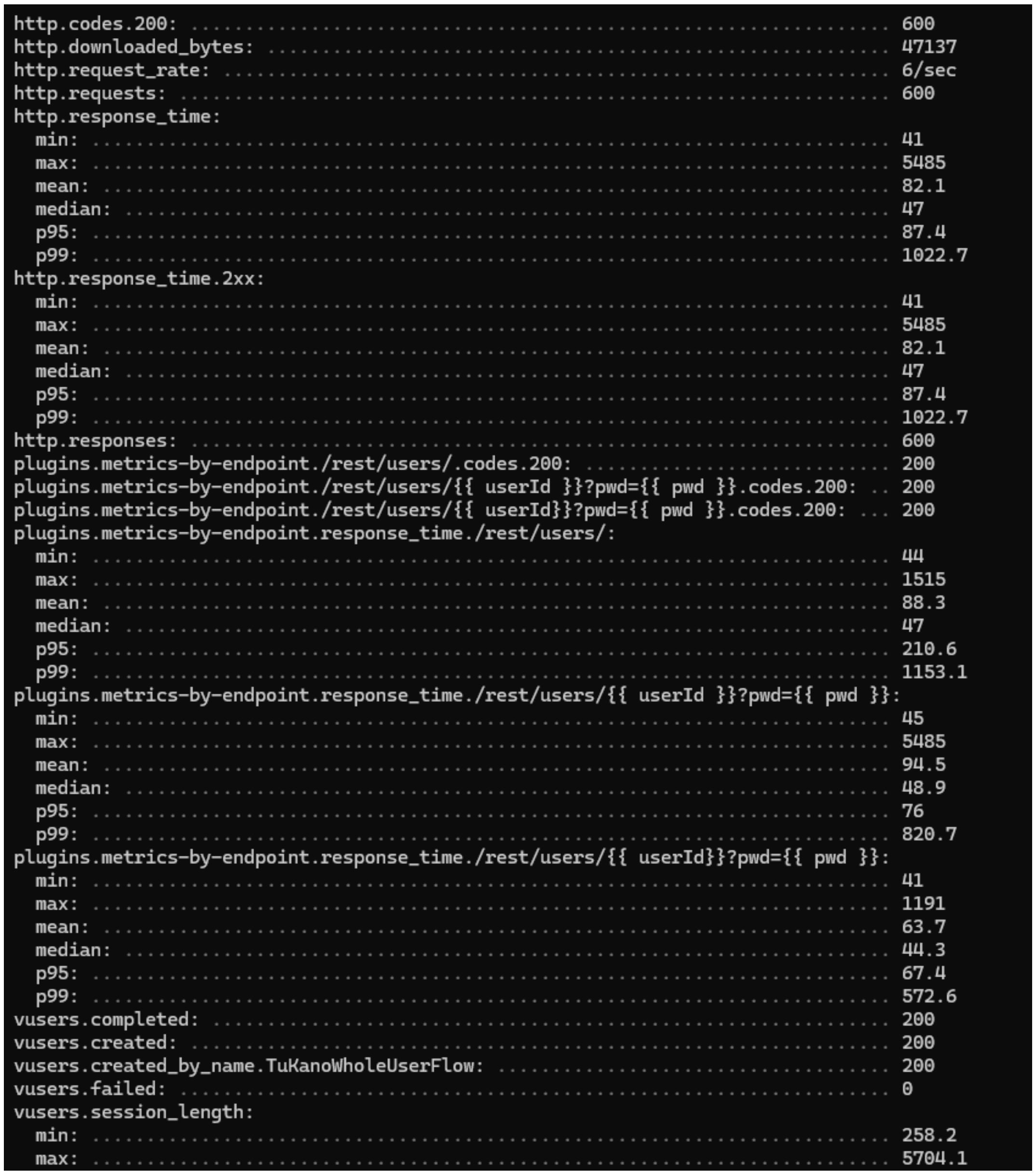
```
plugins.metrics-by-endpoint./tukano/rest/blobs/{{ blobUrl }}.codes.204: ........ 1
plugins.metrics-by-endpoint./tukano/rest/shorts/{{ shortId }}/{{ userId }}/l...  2
plugins.metrics-by-endpoint./tukano/rest/shorts/{{ userId }}/followers?pwd={...  2
plugins.metrics-by-endpoint./tukano/rest/shorts/{{ userId }}/followers?pwd={...  1
plugins.metrics-by-endpoint./tukano/rest/shorts/{{ userId }}/shorts.codes.200: . 6
plugins.metrics-by-endpoint./tukano/rest/shorts/{{ userId }}?pwd={{ pwd }}.c...  1
plugins.metrics-by-endpoint./tukano/rest/shorts/{{ userId1 }}/{{ userId2 }}/...  6
plugins.metrics-by-endpoint.response_time./tukano/rest/blobs/{{ blobUrl }}:
  min: ......................................................................... 3
  max: ......................................................................... 3
  mean: ........................................................................ 3
  median: ...................................................................... 3
  p95: ......................................................................... 3
  p99: ......................................................................... 3
plugins.metrics-by-endpoint.response_time./tukano/rest/shorts/{{ shortId }}/{{ userId }}/likes?pwd={{ pwd }}:
  min: ......................................................................... 2
  max: ......................................................................... 9
  mean: ........................................................................ 5.5
  median: ...................................................................... 2
  p95: ......................................................................... 2
  p99: ......................................................................... 2
plugins.metrics-by-endpoint.response_time./tukano/rest/shorts/{{ userId }}/followers?pwd={{ pwd }}:
  min: ......................................................................... 2
  max: ......................................................................... 4
  mean: ........................................................................ 3.3
  median: ...................................................................... 4
  p95: ......................................................................... 4
  p99: ......................................................................... 4
plugins.metrics-by-endpoint.response_time./tukano/rest/shorts/{{ userId }}/shorts:
  min: ......................................................................... 2
  max: ......................................................................... 63
  mean: ........................................................................ 13.3
  median: ...................................................................... 3
  p95: ......................................................................... 5
  p99: ......................................................................... 5
plugins.metrics-by-endpoint.response_time./tukano/rest/shorts/{{ userId }}?pwd={{ pwd }}:
  min: ......................................................................... 3
  max: ......................................................................... 3
  mean: ........................................................................ 3
  median: ...................................................................... 3
  p95: ......................................................................... 3
  p99: ......................................................................... 3
plugins.metrics-by-endpoint.response_time./tukano/rest/shorts/{{ userId1 }}/{{ userId2 }}/followers?pwd={{ pwd }}:
  min: ......................................................................... 2
  max: ......................................................................... 49
  mean: ........................................................................ 10.8
  median: ...................................................................... 3
  p95: ......................................................................... 4
  p99: ......................................................................... 4
vusers.completed: .............................................................. 18
```

Fig 4. Artillery test ‘realistic_flow.yaml’ for Base Tukano Individual Request Time

Tukano Azure PostgreSQL

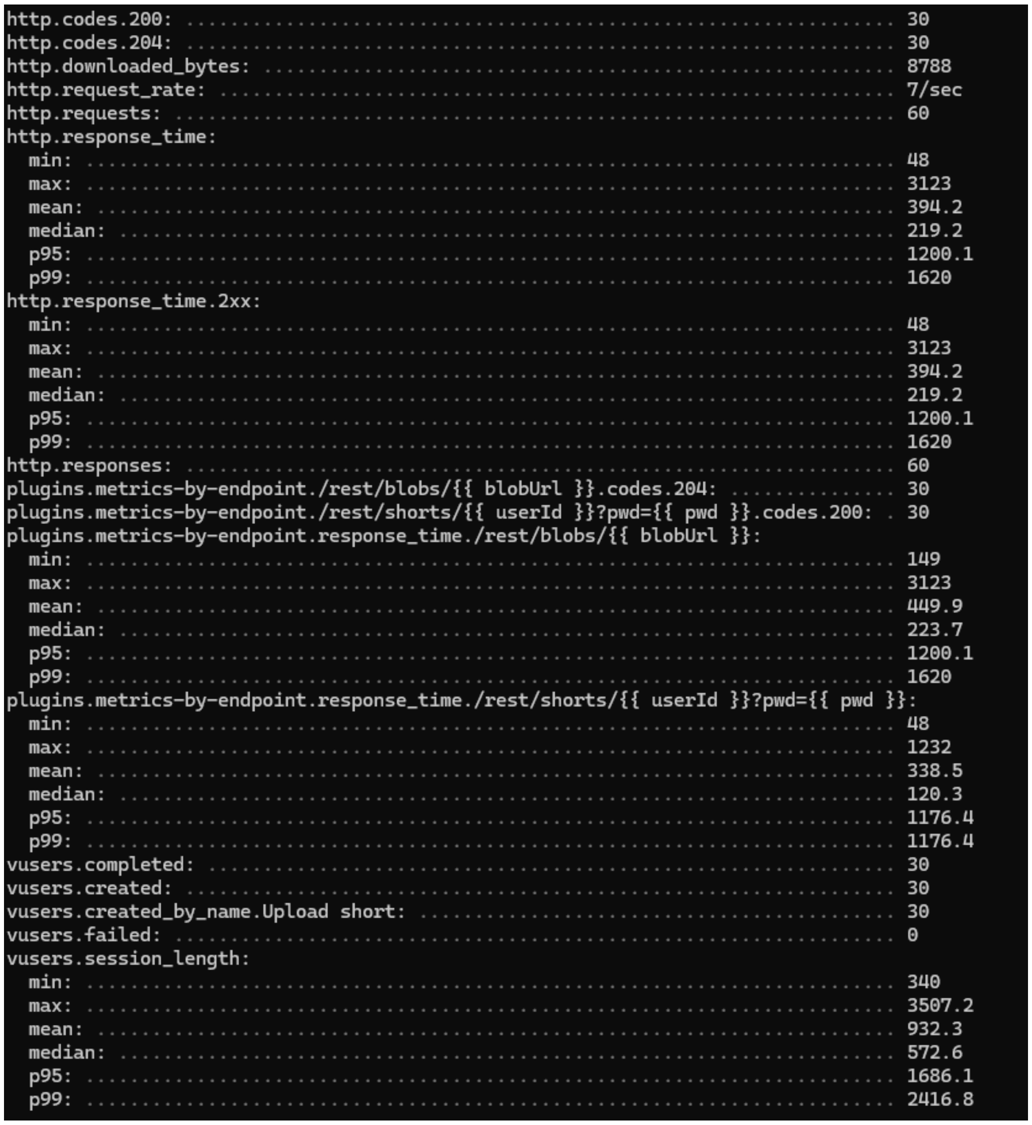
The next images represent the deployed Azure application using Hibernate + PostgreSQL and their respective times using both Cache and no Cache.

No Cache:



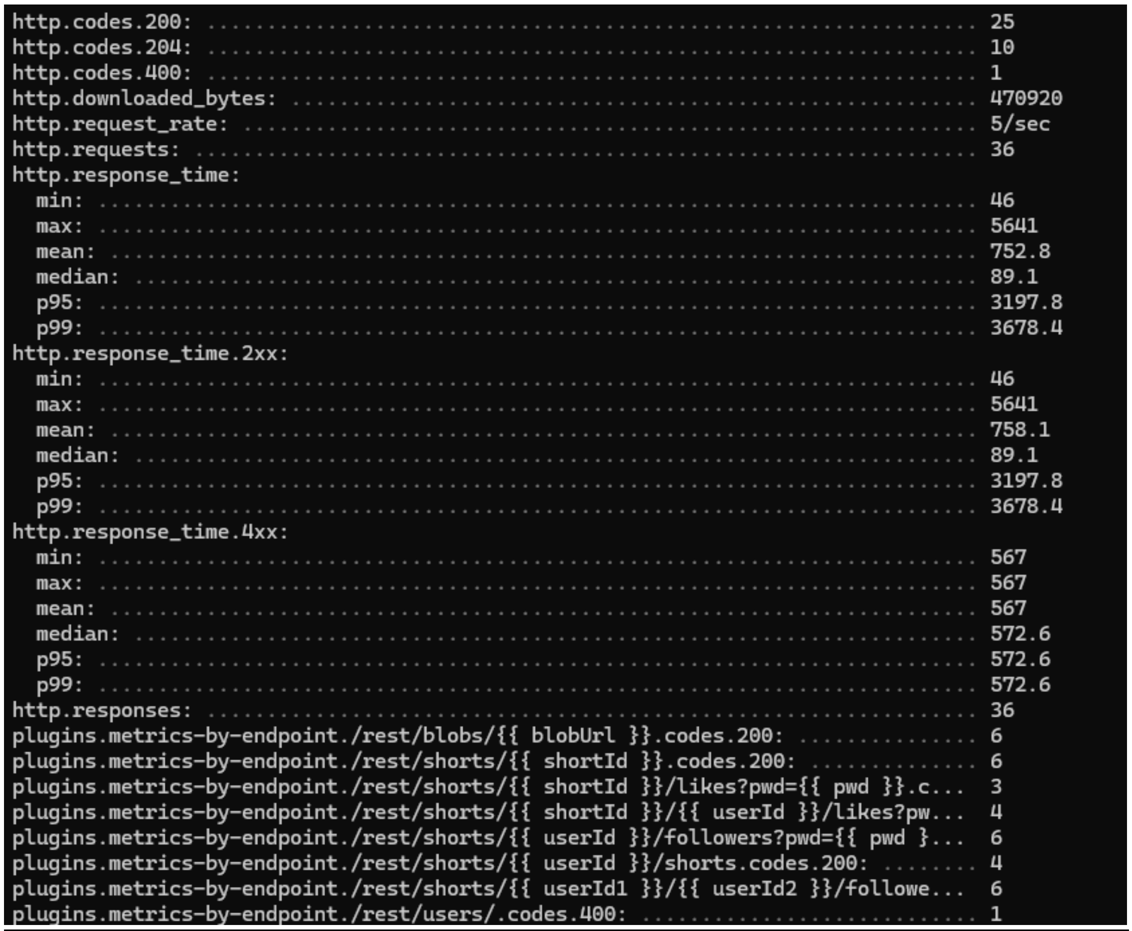
```
http.codes.200: ..................................................................... 600
http.downloaded_bytes: .............................................................. 47137
http.request_rate: .................................................................. 6/sec
http.requests: ...................................................................... 600
http.response_time:
  min: .............................................................................. 41
  max: .............................................................................. 5485
  mean: ............................................................................. 82.1
  median: ........................................................................... 47
  p95: .............................................................................. 87.4
  p99: .............................................................................. 1022.7
http.response_time.2xx:
  min: .............................................................................. 41
  max: .............................................................................. 5485
  mean: ............................................................................. 82.1
  median: ........................................................................... 47
  p95: .............................................................................. 87.4
  p99: .............................................................................. 1022.7
http.responses: ..................................................................... 600
plugins.metrics-by-endpoint./rest/users/.codes.200: ................................. 200
plugins.metrics-by-endpoint./rest/users/{{ userId }}?pwd={{ pwd }}.codes.200: ....... 200
plugins.metrics-by-endpoint./rest/users/{{ userId}}?pwd={{ pwd }}.codes.200: ........ 200
plugins.metrics-by-endpoint.response_time./rest/users/:
  min: .............................................................................. 44
  max: .............................................................................. 1515
  mean: ............................................................................. 88.3
  median: ........................................................................... 47
  p95: .............................................................................. 210.6
  p99: .............................................................................. 1153.1
plugins.metrics-by-endpoint.response_time./rest/users/{{ userId }}?pwd={{ pwd }}:
  min: .............................................................................. 45
  max: .............................................................................. 5485
  mean: ............................................................................. 94.5
  median: ........................................................................... 48.9
  p95: .............................................................................. 76
  p99: .............................................................................. 820.7
plugins.metrics-by-endpoint.response_time./rest/users/{{ userId}}?pwd={{ pwd }}:
  min: .............................................................................. 41
  max: .............................................................................. 1191
  mean: ............................................................................. 63.7
  median: ........................................................................... 44.3
  p95: .............................................................................. 67.4
  p99: .............................................................................. 572.6
vusers.completed: ................................................................... 200
vusers.created: ..................................................................... 200
vusers.created_by_name.TuKanoWholeUserFlow: ......................................... 200
vusers.failed: ...................................................................... 0
vusers.session_length:
  min: .............................................................................. 258.2
  max: .............................................................................. 5704.1
```

Fig 5. Artillery test ‘user_register.yaml’ run with Azure and Postegre with NO cache



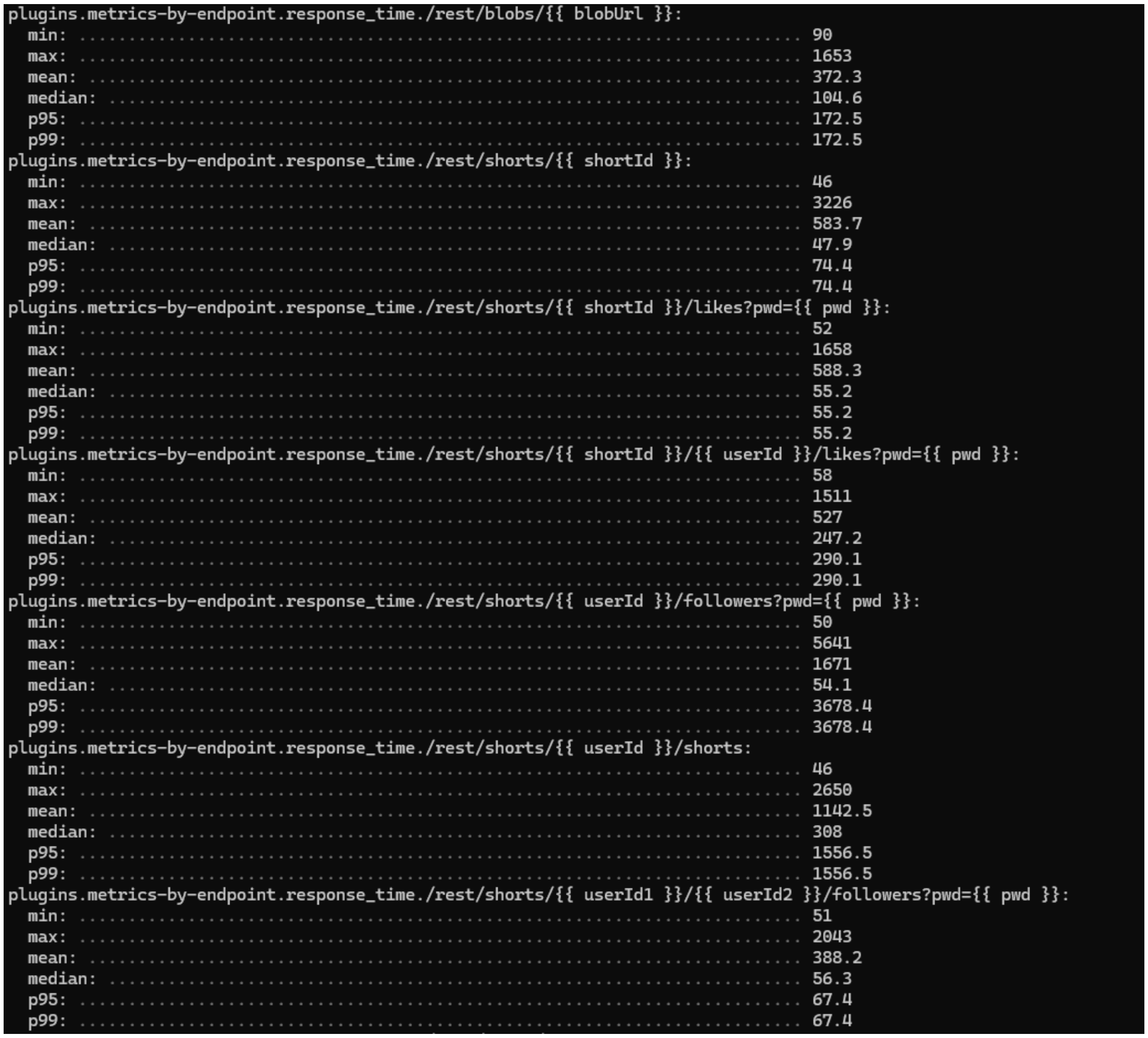
```
http.codes.200: ................................................................ 30
http.codes.204: ................................................................ 30
http.downloaded_bytes: ......................................................... 8788
http.request_rate: ............................................................. 7/sec
http.requests: ................................................................. 60
http.response_time:
  min: ......................................................................... 48
  max: ......................................................................... 3123
  mean: ........................................................................ 394.2
  median: ...................................................................... 219.2
  p95: ......................................................................... 1200.1
  p99: ......................................................................... 1620
http.response_time.2xx:
  min: ......................................................................... 48
  max: ......................................................................... 3123
  mean: ........................................................................ 394.2
  median: ...................................................................... 219.2
  p95: ......................................................................... 1200.1
  p99: ......................................................................... 1620
http.responses: ................................................................ 60
plugins.metrics-by-endpoint./rest/blobs/{{ blobUrl }}.codes.204: ............... 30
plugins.metrics-by-endpoint./rest/shorts/{{ userId }}?pwd={{ pwd }}.codes.200: . 30
plugins.metrics-by-endpoint.response_time./rest/blobs/{{ blobUrl }}:
  min: ......................................................................... 149
  max: ......................................................................... 3123
  mean: ........................................................................ 449.9
  median: ...................................................................... 223.7
  p95: ......................................................................... 1200.1
  p99: ......................................................................... 1620
plugins.metrics-by-endpoint.response_time./rest/shorts/{{ userId }}?pwd={{ pwd }}:
  min: ......................................................................... 48
  max: ......................................................................... 1232
  mean: ........................................................................ 338.5
  median: ...................................................................... 120.3
  p95: ......................................................................... 1176.4
  p99: ......................................................................... 1176.4
vusers.completed: .............................................................. 30
vusers.created: ................................................................ 30
vusers.created_by_name.Upload short: ........................................... 30
vusers.failed: ................................................................. 0
vusers.session_length:
  min: ......................................................................... 340
  max: ......................................................................... 3507.2
  mean: ........................................................................ 932.3
  median: ...................................................................... 572.6
  p95: ......................................................................... 1686.1
  p99: ......................................................................... 2416.8
```

Fig 6. Artillery test ‘upload_shorts.yaml’ run with Azure and Postegre with NO cache



```
http.codes.200: .......................................................... 25
http.codes.204: .......................................................... 10
http.codes.400: .......................................................... 1
http.downloaded_bytes: ................................................... 470920
http.request_rate: ....................................................... 5/sec
http.requests: ........................................................... 36
http.response_time:
  min: ................................................................... 46
  max: ................................................................... 5641
  mean: .................................................................. 752.8
  median: ................................................................ 89.1
  p95: ................................................................... 3197.8
  p99: ................................................................... 3678.4
http.response_time.2xx:
  min: ................................................................... 46
  max: ................................................................... 5641
  mean: .................................................................. 758.1
  median: ................................................................ 89.1
  p95: ................................................................... 3197.8
  p99: ................................................................... 3678.4
http.response_time.4xx:
  min: ................................................................... 567
  max: ................................................................... 567
  mean: .................................................................. 567
  median: ................................................................ 572.6
  p95: ................................................................... 572.6
  p99: ................................................................... 572.6
http.responses: .......................................................... 36
plugins.metrics-by-endpoint./rest/blobs/{{ blobUrl }}.codes.200: ............... 6
plugins.metrics-by-endpoint./rest/shorts/{{ shortId }}.codes.200: .............. 6
plugins.metrics-by-endpoint./rest/shorts/{{ shortId }}/likes?pwd={{ pwd }}.c...  3
plugins.metrics-by-endpoint./rest/shorts/{{ shortId }}/{{ userId }}/likes?pw...  4
plugins.metrics-by-endpoint./rest/shorts/{{ userId }}/followers?pwd={{ pwd }...  6
plugins.metrics-by-endpoint./rest/shorts/{{ userId }}/shorts.codes.200: ........ 4
plugins.metrics-by-endpoint./rest/shorts/{{ userId1 }}/{{ userId2 }}/followe...  6
plugins.metrics-by-endpoint./rest/users/.codes.400: ............................ 1
```

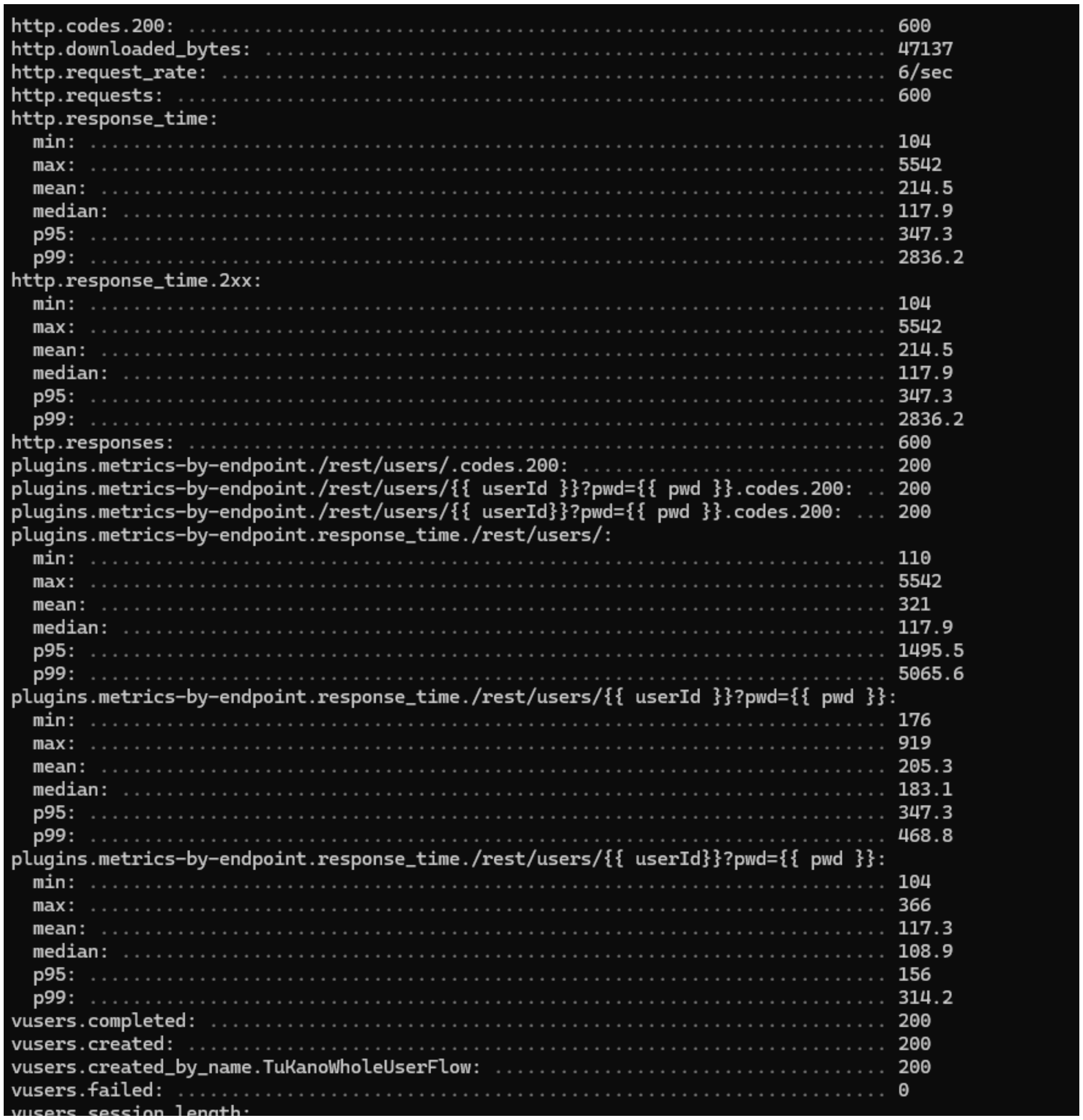
Fig 7. Artillery test ‘realistic_flow.yaml’ run with Azure and Postegre with NO cache



```
plugins.metrics-by-endpoint.response_time./rest/blobs/{{ blobUrl }}:
  min: ......................................................................... 90
  max: ......................................................................... 1653
  mean: ........................................................................ 372.3
  median: ...................................................................... 104.6
  p95: ......................................................................... 172.5
  p99: ......................................................................... 172.5
plugins.metrics-by-endpoint.response_time./rest/shorts/{{ shortId }}:
  min: ......................................................................... 46
  max: ......................................................................... 3226
  mean: ........................................................................ 583.7
  median: ...................................................................... 47.9
  p95: ......................................................................... 74.4
  p99: ......................................................................... 74.4
plugins.metrics-by-endpoint.response_time./rest/shorts/{{ shortId }}/likes?pwd={{ pwd }}:
  min: ......................................................................... 52
  max: ......................................................................... 1658
  mean: ........................................................................ 588.3
  median: ...................................................................... 55.2
  p95: ......................................................................... 55.2
  p99: ......................................................................... 55.2
plugins.metrics-by-endpoint.response_time./rest/shorts/{{ shortId }}/{{ userId }}/likes?pwd={{ pwd }}:
  min: ......................................................................... 58
  max: ......................................................................... 1511
  mean: ........................................................................ 527
  median: ...................................................................... 247.2
  p95: ......................................................................... 290.1
  p99: ......................................................................... 290.1
plugins.metrics-by-endpoint.response_time./rest/shorts/{{ userId }}/followers?pwd={{ pwd }}:
  min: ......................................................................... 50
  max: ......................................................................... 5641
  mean: ........................................................................ 1671
  median: ...................................................................... 54.1
  p95: ......................................................................... 3678.4
  p99: ......................................................................... 3678.4
plugins.metrics-by-endpoint.response_time./rest/shorts/{{ userId }}/shorts:
  min: ......................................................................... 46
  max: ......................................................................... 2650
  mean: ........................................................................ 1142.5
  median: ...................................................................... 308
  p95: ......................................................................... 1556.5
  p99: ......................................................................... 1556.5
plugins.metrics-by-endpoint.response_time./rest/shorts/{{ userId1 }}/{{ userId2 }}/followers?pwd={{ pwd }}:
  min: ......................................................................... 51
  max: ......................................................................... 2043
  mean: ........................................................................ 388.2
  median: ...................................................................... 56.3
  p95: ......................................................................... 67.4
  p99: ......................................................................... 67.4
```

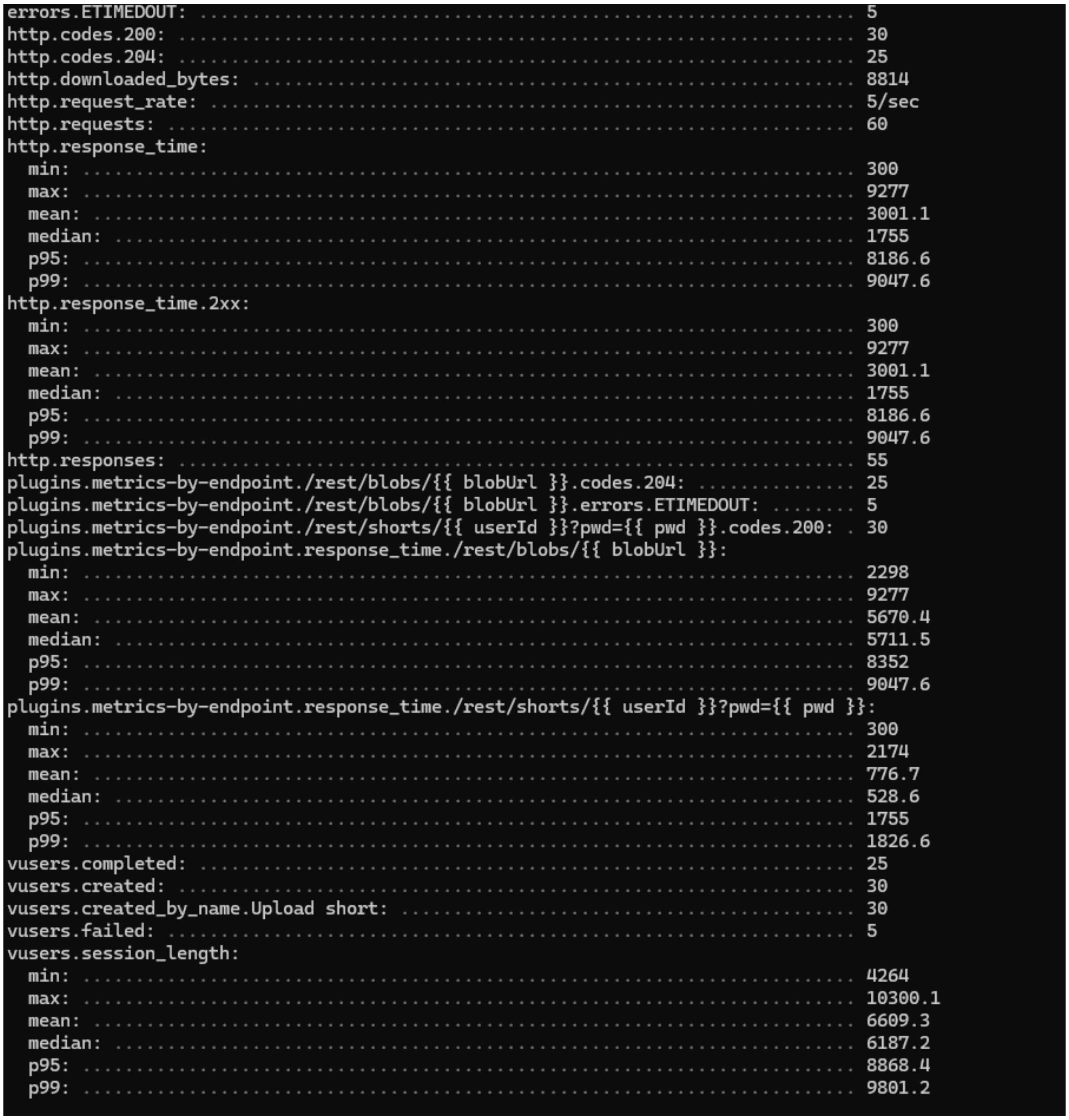
Fig 8. Artillery test ‘realistic_flow.yaml’ run with Azure and Postegre with NO cache Cont.

With Cache:



```
http.codes.200: ............................................................. 600
http.downloaded_bytes: ...................................................... 47137
http.request_rate: .......................................................... 6/sec
http.requests: .............................................................. 600
http.response_time:
  min: ...................................................................... 104
  max: ...................................................................... 5542
  mean: ..................................................................... 214.5
  median: ................................................................... 117.9
  p95: ...................................................................... 347.3
  p99: ...................................................................... 2836.2
http.response_time.2xx:
  min: ...................................................................... 104
  max: ...................................................................... 5542
  mean: ..................................................................... 214.5
  median: ................................................................... 117.9
  p95: ...................................................................... 347.3
  p99: ...................................................................... 2836.2
http.responses: ............................................................. 600
plugins.metrics-by-endpoint./rest/users/.codes.200: ......................... 200
plugins.metrics-by-endpoint./rest/users/{{ userId }}?pwd={{ pwd }}.codes.200: .. 200
plugins.metrics-by-endpoint./rest/users/{{ userId}}?pwd={{ pwd }}.codes.200: ... 200
plugins.metrics-by-endpoint.response_time./rest/users/:
  min: ...................................................................... 110
  max: ...................................................................... 5542
  mean: ..................................................................... 321
  median: ................................................................... 117.9
  p95: ...................................................................... 1495.5
  p99: ...................................................................... 5065.6
plugins.metrics-by-endpoint.response_time./rest/users/{{ userId }}?pwd={{ pwd }}:
  min: ...................................................................... 176
  max: ...................................................................... 919
  mean: ..................................................................... 205.3
  median: ................................................................... 183.1
  p95: ...................................................................... 347.3
  p99: ...................................................................... 468.8
plugins.metrics-by-endpoint.response_time./rest/users/{{ userId}}?pwd={{ pwd }}:
  min: ...................................................................... 104
  max: ...................................................................... 366
  mean: ..................................................................... 117.3
  median: ................................................................... 108.9
  p95: ...................................................................... 156
  p99: ...................................................................... 314.2
vusers.completed: ........................................................... 200
vusers.created: ............................................................. 200
vusers.created_by_name.TuKanoWholeUserFlow: ................................. 200
vusers.failed: .............................................................. 0
```

Fig 9. Artillery test ‘user_register.yaml’ run with Azure and Postegre with cache

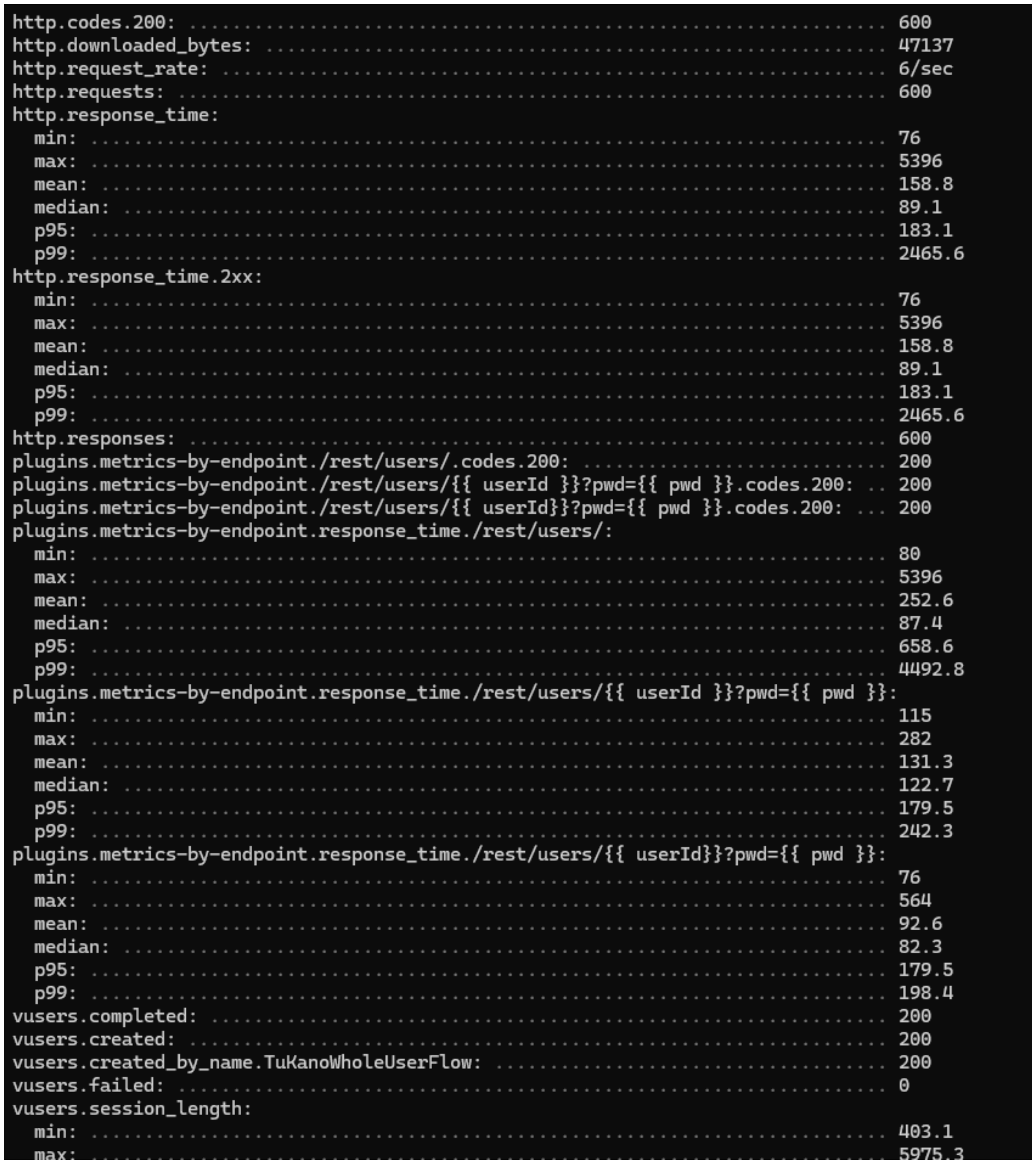


```
errors.ETIMEDOUT: ............................................................. 5
http.codes.200: ............................................................... 30
http.codes.204: ............................................................... 25
http.downloaded_bytes: ........................................................ 8814
http.request_rate: ............................................................ 5/sec
http.requests: ................................................................ 60
http.response_time:
  min: ........................................................................ 300
  max: ........................................................................ 9277
  mean: ....................................................................... 3001.1
  median: ..................................................................... 1755
  p95: ........................................................................ 8186.6
  p99: ........................................................................ 9047.6
http.response_time.2xx:
  min: ........................................................................ 300
  max: ........................................................................ 9277
  mean: ....................................................................... 3001.1
  median: ..................................................................... 1755
  p95: ........................................................................ 8186.6
  p99: ........................................................................ 9047.6
http.responses: ............................................................... 55
plugins.metrics-by-endpoint./rest/blobs/{{ blobUrl }}.codes.204: .............. 25
plugins.metrics-by-endpoint./rest/blobs/{{ blobUrl }}.errors.ETIMEDOUT: ....... 5
plugins.metrics-by-endpoint./rest/shorts/{{ userId }}?pwd={{ pwd }}.codes.200: . 30
plugins.metrics-by-endpoint.response_time./rest/blobs/{{ blobUrl }}:
  min: ........................................................................ 2298
  max: ........................................................................ 9277
  mean: ....................................................................... 5670.4
  median: ..................................................................... 5711.5
  p95: ........................................................................ 8352
  p99: ........................................................................ 9047.6
plugins.metrics-by-endpoint.response_time./rest/shorts/{{ userId }}?pwd={{ pwd }}:
  min: ........................................................................ 300
  max: ........................................................................ 2174
  mean: ....................................................................... 776.7
  median: ..................................................................... 528.6
  p95: ........................................................................ 1755
  p99: ........................................................................ 1826.6
vusers.completed: ............................................................. 25
vusers.created: ............................................................... 30
vusers.created_by_name.Upload short: .......................................... 30
vusers.failed: ................................................................ 5
vusers.session_length:
  min: ........................................................................ 4264
  max: ........................................................................ 10300.1
  mean: ....................................................................... 6609.3
  median: ..................................................................... 6187.2
  p95: ........................................................................ 8868.4
  p99: ........................................................................ 9801.2
```

Fig 10. Artillery test ‘upload_shorts.yaml’ run with Azure and Postegre with cache

Tukano Azure NoSQL

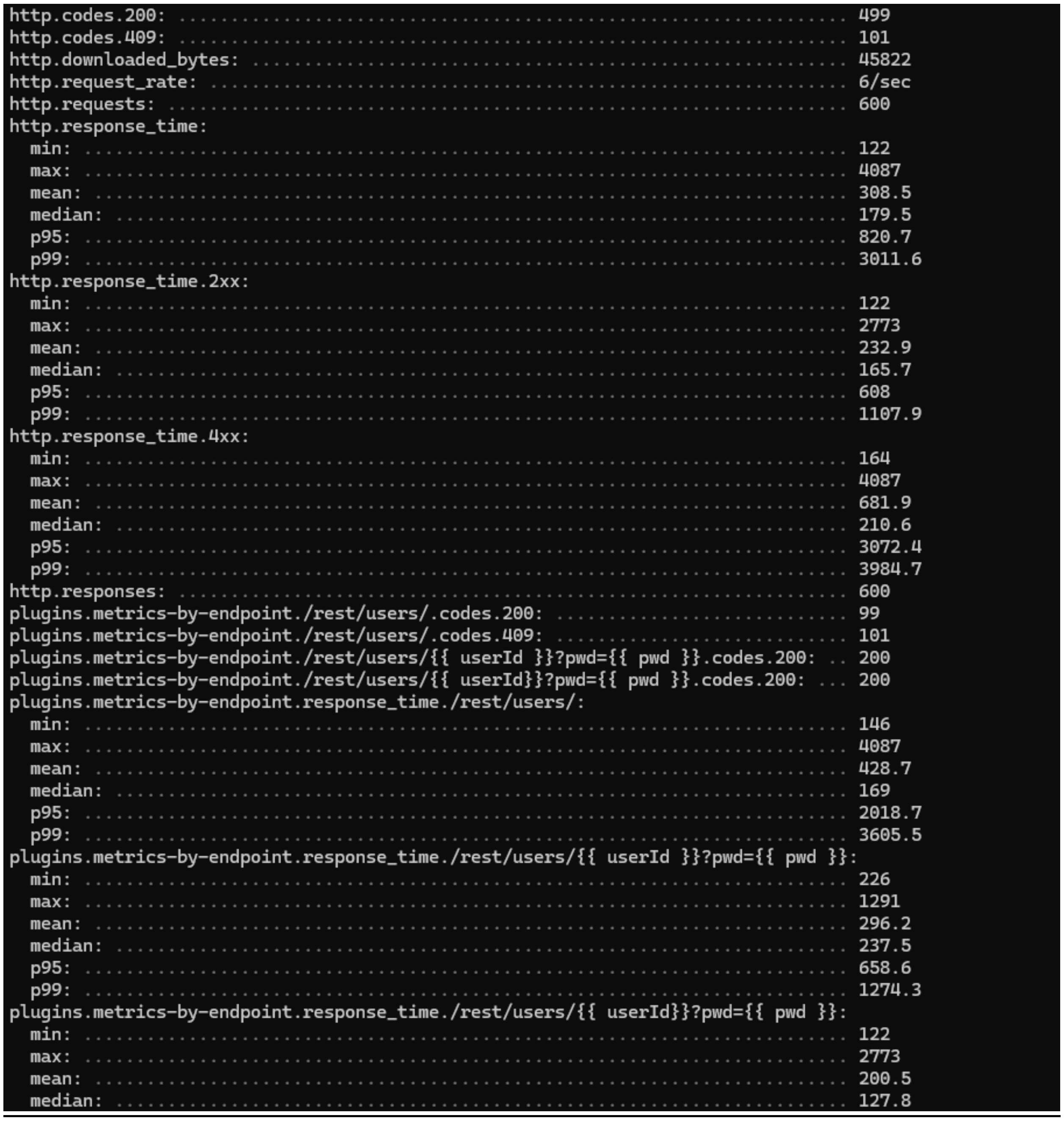
No Cache:



```
http.codes.200: ............................................................... 600
http.downloaded_bytes: ........................................................ 47137
http.request_rate: ............................................................ 6/sec
http.requests: ................................................................ 600
http.response_time:
  min: ........................................................................ 76
  max: ........................................................................ 5396
  mean: ....................................................................... 158.8
  median: ..................................................................... 89.1
  p95: ........................................................................ 183.1
  p99: ........................................................................ 2465.6
http.response_time.2xx:
  min: ........................................................................ 76
  max: ........................................................................ 5396
  mean: ....................................................................... 158.8
  median: ..................................................................... 89.1
  p95: ........................................................................ 183.1
  p99: ........................................................................ 2465.6
http.responses: ............................................................... 600
plugins.metrics-by-endpoint./rest/users/.codes.200: ........................... 200
plugins.metrics-by-endpoint./rest/users/{{ userId }}?pwd={{ pwd }}.codes.200: .. 200
plugins.metrics-by-endpoint./rest/users/{{ userId}}?pwd={{ pwd }}.codes.200: ... 200
plugins.metrics-by-endpoint.response_time./rest/users/:
  min: ........................................................................ 80
  max: ........................................................................ 5396
  mean: ....................................................................... 252.6
  median: ..................................................................... 87.4
  p95: ........................................................................ 658.6
  p99: ........................................................................ 4492.8
plugins.metrics-by-endpoint.response_time./rest/users/{{ userId }}?pwd={{ pwd }}:
  min: ........................................................................ 115
  max: ........................................................................ 282
  mean: ....................................................................... 131.3
  median: ..................................................................... 122.7
  p95: ........................................................................ 179.5
  p99: ........................................................................ 242.3
plugins.metrics-by-endpoint.response_time./rest/users/{{ userId}}?pwd={{ pwd }}:
  min: ........................................................................ 76
  max: ........................................................................ 564
  mean: ....................................................................... 92.6
  median: ..................................................................... 82.3
  p95: ........................................................................ 179.5
  p99: ........................................................................ 198.4
vusers.completed: ............................................................. 200
vusers.created: ............................................................... 200
vusers.created_by_name.TuKanoWholeUserFlow: .................................. 200
vusers.failed: ................................................................ 0
vusers.session_length:
  min: ........................................................................ 403.1
  max: ........................................................................ 5975.3
```

Fig 11. Artillery test ‘user_register.yaml’ run with Azure and NoSQL with NO cache

With Cache:



```
http.codes.200: ............................................................ 499
http.codes.409: ............................................................ 101
http.downloaded_bytes: ..................................................... 45822
http.request_rate: ......................................................... 6/sec
http.requests: ............................................................. 600
http.response_time:
  min: ..................................................................... 122
  max: ..................................................................... 4087
  mean: .................................................................... 308.5
  median: .................................................................. 179.5
  p95: ..................................................................... 820.7
  p99: ..................................................................... 3011.6
http.response_time.2xx:
  min: ..................................................................... 122
  max: ..................................................................... 2773
  mean: .................................................................... 232.9
  median: .................................................................. 165.7
  p95: ..................................................................... 608
  p99: ..................................................................... 1107.9
http.response_time.4xx:
  min: ..................................................................... 164
  max: ..................................................................... 4087
  mean: .................................................................... 681.9
  median: .................................................................. 210.6
  p95: ..................................................................... 3072.4
  p99: ..................................................................... 3984.7
http.responses: ............................................................ 600
plugins.metrics-by-endpoint./rest/users/.codes.200: ........................ 99
plugins.metrics-by-endpoint./rest/users/.codes.409: ........................ 101
plugins.metrics-by-endpoint./rest/users/{{ userId }}?pwd={{ pwd }}.codes.200: .. 200
plugins.metrics-by-endpoint./rest/users/{{ userId}}?pwd={{ pwd }}.codes.200: ... 200
plugins.metrics-by-endpoint.response_time./rest/users/:
  min: ..................................................................... 146
  max: ..................................................................... 4087
  mean: .................................................................... 428.7
  median: .................................................................. 169
  p95: ..................................................................... 2018.7
  p99: ..................................................................... 3605.5
plugins.metrics-by-endpoint.response_time./rest/users/{{ userId }}?pwd={{ pwd }}:
  min: ..................................................................... 226
  max: ..................................................................... 1291
  mean: .................................................................... 296.2
  median: .................................................................. 237.5
  p95: ..................................................................... 658.6
  p99: ..................................................................... 1274.3
plugins.metrics-by-endpoint.response_time./rest/users/{{ userId}}?pwd={{ pwd }}:
  min: ..................................................................... 122
  max: ..................................................................... 2773
  mean: .................................................................... 200.5
  median: .................................................................. 127.8
```

Fig 12. Artillery test ‘user_register.yaml’ run with Azure and NoSQL with cache