

Azure TuKano

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Project Assignment #2 - Azure PaaS

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1. Docker and Kubernetes

To convert current application to use Kubernetes using IaaS facilities, firstly we prepared Docker images and utilized Docker Compose to run and test them locally. Then we transformed Docker Compose into Kubernetes configuration which after local testing, we deployed to Azure Kubernetes Service. We divided functionalities into 5 different services:

- java-app - main Tukano application
- postgres - contain application database
- redis - works as cache for Tukano application
- blob-service - stores blobs uploaded to system utilizing *FilesystemStorage*
- function-service - Replace Azure Functions

Java-app

In this container we include most of previous application logic and only stripped it with certain functionalities that are separated in others containers. Dockerfile uses *tomcat:10.0-jdk17-openjdk* image to create a new image. We use an SQL implementation, with the database connection configured through the *hibernate.cfg.xml* file. The database URL in the configuration references the Kubernetes service name.

Postgres

We created a container from default *postgres:latest* image to work as a database, to which we connected using Hibernate.

Redis

Redis holds our application cache and we use it instead of Azure Cache for Redis PaaS. To do it we utilized *redis:latest* image, but previously made implementation using Jedis did not need any changes.

Blob-service

Instead of using Azure Blob Service, now *FilesystemStorage* has been separated from the main application and has been implemented as a separate container. Just like java-app, it also uses *tomcat:10.0-jdk17-openjdk* image as a base for its Dockerfile. Java-app delegate blob-service to save, get or delete blobs using HTTP requests, which allow connecting these two services.

Function-service

Similarly to other services function-service also utilize *tomcat:10.0-jdk17-openjdk* image and replace functionalities previously included in Azure Functions. Tukano implemented using Azure PaaS triggered Azure Functions using HTTP requests, so change didn't request many changes in the main application. Incrementing download counter functionality is now available under REST endpoint in function-service. After getting a request with downloaded blob from java-app, function-service connects to the database and accordingly increments counter.

2. Azure Kubernetes Service

To transition from Docker Compose to Kubernetes, we began by pushing the container images for the `java-app`, `blob-service`, and `function-service` to Docker Hub. Next, we utilized Minikube to test the Kubernetes deployment locally, adapting the Docker Compose setup to Kubernetes configurations. Once we achieved a fully functional Kubernetes environment locally, we followed the guidelines from Lab 10 to deploy the configuration to Azure Kubernetes Service (AKS) in different regions.

3. User session authentication for the Blobs Service

Users can log into the application at `users/{userId}?pwd={userPassword}` endpoint, which will return a cookie with random UUID that has limited valid time. Server also adds this UUID to its redis cache, from which it will be able to download them when the user will try to use other application functionalities. Application using filters intercepts all requests and get included cookies for later use, as well it attaches them to the response. On download and upload the blob endpoint system checks if the user has a valid session to do so. On delete blob endpoint it allows only admin to perform this action and if it detects wrong `userId` it returns *Not Authorized* response.

4. Artillery tests

The application was deployed to Azure Kubernetes Services (AKS) in two regions: North Europe and Australia, to evaluate and compare response times across geographically distinct locations. Performance tests were conducted using Artillery, executed from a local machine in Lisbon. The results of these tests were also compared to data from the previous report. The primary objectives of this analysis were to assess the performance differences between Azure Kubernetes Services (AKS) and Azure Platform as a Service (PaaS) offerings, as well as to examine the impact of regional deployment on application performance.

Comparison between different regions and PaaS solution

	North Europe [ms]	Australia Central [ms]	PaaS - SQL with cache [ms]
Post User	60.9	281.3	295.7
Get User	49.8	276.9	45.9
Post Short	51.2	279.3	1174
Get Shorts	49.9	278.7	189.5
User register	54.1	281.5	257
Upload shorts	90.4	463.6	198.8
Realistic flow	54.3	306.3	246.1

User delete	58.1	284	423.8
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The performance results, summarized in the table above, highlight key differences between deployments in Azure Kubernetes Services (AKS) and Azure Platform as a Service (PaaS), as well as between regions. The deployment in North Europe consistently delivered the best response times across all test cases. This superior performance can be attributed to the internal communication efficiency within Kubernetes clusters, which is often faster and more optimized compared to Azure PaaS. Additionally, the response times in both AKS North Europe and Australia Central were more stable, with less variability between different types of requests, indicating a predictable and robust system behavior.

As expected, the deployment in Australia Central demonstrated significantly higher response times for all operations when tested from Lisbon. This is a clear consequence of the geographical distance, which adds network latency to each request. This reinforces the importance of deploying applications closer to their user base to reduce latency and enhance the user experience.

Appendix: Artillery Test Results

Australia

Post User

```

http.codes.200: ..... 50
http.downloaded_bytes: ..... 291
http.request_rate: ..... 1/sec
http.requests: ..... 50
http.response_time:
  min: ..... 277
  max: ..... 305
  mean: ..... 281.3
  median: ..... 278.7
  p95: ..... 284.3
  p99: ..... 301.9
http.response_time.2xx:
  min: ..... 277
  max: ..... 305
  mean: ..... 281.3
  median: ..... 278.7
  p95: ..... 284.3
  p99: ..... 301.9
http.responses: ..... 50
vusers.completed: ..... 50
vusers.created: ..... 50
vusers.created_by_name.TuKanoRegister: ..... 50
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 554.3
  max: ..... 640.6
  mean: ..... 564.9
  median: ..... 561.2
  p95: ..... 584.2
  p99: ..... 620.3

```

Get User

```

http.codes.200: ..... 100
http.downloaded_bytes: ..... 3800
http.request_rate: ..... 10/sec
http.requests: ..... 100
http.response_time:
  min: ..... 273
  max: ..... 300
  mean: ..... 276.9
  median: ..... 278.7
  p95: ..... 278.7
  p99: ..... 284.3
http.response_time.2xx:
  min: ..... 273
  max: ..... 300
  mean: ..... 276.9
  median: ..... 278.7
  p95: ..... 278.7
  p99: ..... 284.3
http.responses: ..... 100
vusers.completed: ..... 50
vusers.created: ..... 50
vusers.created_by_name.TuKanoGetUsers: ..... 50
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 823.3
  max: ..... 869.5
  mean: ..... 834.7
  median: ..... 837.3
  p95: ..... 837.3
  p99: ..... 854.2

```

Post Short

```

http.codes.200: ..... 100
http.downloaded_bytes: ..... 15446
http.request_rate: ..... 29/sec
http.requests: ..... 100
http.response_time:
  min: ..... 272
  max: ..... 306
  mean: ..... 279.3
  median: ..... 278.7
  p95: ..... 290.1
  p99: ..... 295.9
http.response_time.2xx:
  min: ..... 272
  max: ..... 306
  mean: ..... 279.3
  median: ..... 278.7
  p95: ..... 290.1
  p99: ..... 295.9
http.responses: ..... 100
plugins.metrics-by-endpoint./tukano-1/rest/shorts/user1?pwd=pass1.codes.200: ... 50
plugins.metrics-by-endpoint./tukano-1/rest/users/admin?pwd=admin.codes.200: ... 50
plugins.metrics-by-endpoint.response_time./tukano-1/rest/shorts/user1?pwd=pass1:
  min: ..... 276
  max: ..... 306
  mean: ..... 281.1
  median: ..... 278.7
  p95: ..... 284.3
  p99: ..... 290.1
plugins.metrics-by-endpoint.response_time./tukano-1/rest/users/admin?pwd=admin:

```

```

min: ..... 272
max: ..... 296
mean: ..... 277.5
median: ..... 278.7
p95: ..... 290.1
p99: ..... 295.9
vusers.completed: ..... 50
vusers.created: ..... 50
vusers.created_by_name.TuKanoPostShort: ..... 50
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 822
  max: ..... 858.1
  mean: ..... 836.8
  median: ..... 837.3
  p95: ..... 854.2
  p99: ..... 854.2

```

Get Shorts

```

http.codes.200: ..... 100
http.downloaded_bytes: ..... 14846
http.request_rate: ..... 29/sec
http.requests: ..... 100
http.response_time:
  min: ..... 273
  max: ..... 319
  mean: ..... 278.7
  median: ..... 278.7
  p95: ..... 290.1
  p99: ..... 308
http.response_time.2xx:
  min: ..... 273
  max: ..... 319
  mean: ..... 278.7
  median: ..... 278.7
  p95: ..... 290.1
  p99: ..... 308
http.responses: ..... 100
vusers.completed: ..... 50
vusers.created: ..... 50
vusers.created_by_name.TuKanoGetShort: ..... 50
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 824.7
  max: ..... 880.8
  mean: ..... 836.5
  median: ..... 837.3
  p95: ..... 854.2
  p99: ..... 871.5

```

User register

```

http.codes.200: ..... 600
http.downloaded_bytes: ..... 47137
http.request_rate: ..... 6/sec
http.requests: ..... 600
http.response_time:
  min: ..... 274
  max: ..... 472
  mean: ..... 281.5
  median: ..... 278.7
  p95: ..... 290.1
  p99: ..... 301.9
http.response_time.2xx:

```

```

min: ..... 274
max: ..... 472
mean: ..... 281.5
median: ..... 278.7
p95: ..... 290.1
p99: ..... 301.9
http.responses: ..... 600
plugins.metrics-by-endpoint./tukano-1/rest/users/.codes.200: ..... 200
plugins.metrics-by-endpoint./tukano-1/rest/users/{{ userId }}?pwd={{ pwd }}.... 400
plugins.metrics-by-endpoint.response_time./tukano-1/rest/users/:
  min: ..... 277
  max: ..... 373
  mean: ..... 282
  median: ..... 278.7
  p95: ..... 290.1
  p99: ..... 301.9
plugins.metrics-by-endpoint.response_time./tukano-1/rest/users/{{ userId }}?pwd={{ pwd }}:
  min: ..... 274
  max: ..... 472
  mean: ..... 281.2
  median: ..... 278.7
  p95: ..... 290.1
  p99: ..... 301.9
vusers.completed: ..... 200
vusers.created: ..... 200
vusers.created_by_name.TuKanoWholeUserFlow: ..... 200
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 1107.7
  max: ..... 1423.5
  mean: ..... 1128.4
  median: ..... 1130.2
  p95: ..... 1153.1
  p99: ..... 1176.4

```

Upload shorts

```

http.codes.200: ..... 60
http.codes.204: ..... 30
http.downloaded_bytes: ..... 10013
http.request_rate: ..... 8/sec
http.requests: ..... 90
http.response_time:
  min: ..... 275
  max: ..... 1118
  mean: ..... 463.6
  median: ..... 284.3
  p95: ..... 854.2
  p99: ..... 1107.9
http.response_time.2xx:
  min: ..... 275
  max: ..... 1118
  mean: ..... 463.6
  median: ..... 284.3
  p95: ..... 854.2
  p99: ..... 1107.9
http.responses: ..... 90
plugins.metrics-by-endpoint./tukano-1/rest/blobs/{{ blobUrl }}.codes.204: ..... 30
plugins.metrics-by-endpoint./tukano-1/rest/shorts/{{ userId }}?pwd={{ pwd }}... 30
plugins.metrics-by-endpoint./tukano-1/rest/users/admin?pwd=admin.codes.200: .... 30
plugins.metrics-by-endpoint.response_time./tukano-1/rest/blobs/{{ blobUrl }}:
  min: ..... 557
  max: ..... 1118
  mean: ..... 826.4
  median: ..... 837.3
  p95: ..... 1107.9
  p99: ..... 1107.9

```

```

plugins.metrics-by-endpoint.response_time./tukano-1/rest/shorts/{{ userId }}?pwd={{ pwd }}:
  min: ..... 279
  max: ..... 354
  mean: ..... 286.1
  median: ..... 284.3
  p95: ..... 284.3
  p99: ..... 333.7
plugins.metrics-by-endpoint.response_time./tukano-1/rest/users/admin?pwd=admin:
  min: ..... 275
  max: ..... 283
  mean: ..... 278.2
  median: ..... 278.7
  p95: ..... 284.3
  p99: ..... 284.3
vusers.completed: ..... 30
vusers.created: ..... 30
vusers.created_by_name.Upload short: ..... 30
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 1400.9
  max: ..... 2106.7
  mean: ..... 1689.5
  median: ..... 1686.1
  p95: ..... 1978.7
  p99: ..... 1978.7

```

Realistic flow

```

errors.Cannot read properties of undefined (reading 'ownerId'): ..... 10
http.codes.200: ..... 11
http.codes.204: ..... 3
http.codes.404: ..... 1
http.codes.500: ..... 15
http.downloaded_bytes: ..... 5735
http.request_rate: ..... 4/sec
http.requests: ..... 30
http.response_time:
  min: ..... 274
  max: ..... 842
  mean: ..... 306.3
  median: ..... 278.7
  p95: ..... 327.1
  p99: ..... 415.8
http.response_time.2xx:
  min: ..... 274
  max: ..... 842
  mean: ..... 323.4
  median: ..... 278.7
  p95: ..... 314.2
  p99: ..... 314.2
http.response_time.4xx:
  min: ..... 326
  max: ..... 326
  mean: ..... 326
  median: ..... 327.1
  p95: ..... 327.1
  p99: ..... 327.1
http.response_time.5xx:
  min: ..... 276
  max: ..... 413
  mean: ..... 289.1
  median: ..... 278.7
  p95: ..... 284.3
  p99: ..... 284.3
http.responses: ..... 30

```



```

plugins.metrics-by-endpoint./tukano-1/rest/blobs/{{ blobUrl }}.codes.204: ..... 1
plugins.metrics-by-endpoint./tukano-1/rest/shorts/{{ shortId }}/{{ userId }}... 1
plugins.metrics-by-endpoint./tukano-1/rest/shorts/{{ userId }}/feed?pwd={{ p... 15
plugins.metrics-by-endpoint./tukano-1/rest/shorts/{{ userId }}?pwd={{ pwd }}... 1
plugins.metrics-by-endpoint./tukano-1/rest/shorts/{{ userId1 }}/{{ userId2 }}... 2
plugins.metrics-by-endpoint./tukano-1/rest/users/.codes.200: ..... 1
plugins.metrics-by-endpoint./tukano-1/rest/users/admin?pwd=admin.codes.200: .... 9
plugins.metrics-by-endpoint.response_time./tukano-1/rest/blobs/{{ blobUrl }}:
  min: ..... 842
  max: ..... 842
  mean: ..... 842
  median: ..... 837.3
  p95: ..... 837.3
  p99: ..... 837.3
plugins.metrics-by-endpoint.response_time./tukano-1/rest/shorts/{{ shortId }}/{{ userId }}/likes?pwd={{ pwd }}:
  min: ..... 326
  max: ..... 326
  mean: ..... 326
  median: ..... 327.1
  p95: ..... 327.1
  p99: ..... 327.1
plugins.metrics-by-endpoint.response_time./tukano-1/rest/shorts/{{ userId }}/feed?pwd={{ pwd }}:
  min: ..... 276
  max: ..... 413
  mean: ..... 289.1
  median: ..... 278.7
  p95: ..... 284.3
  p99: ..... 284.3
plugins.metrics-by-endpoint.response_time./tukano-1/rest/shorts/{{ userId }}?pwd={{ pwd }}:
  min: ..... 289
  max: ..... 289
  mean: ..... 289
  median: ..... 290.1
  p95: ..... 290.1
  p99: ..... 290.1
plugins.metrics-by-endpoint.response_time./tukano-1/rest/shorts/{{ userId1 }}/{{ userId2 }}/followers?pwd={{ pwd }}:
  min: ..... 283
  max: ..... 315
  mean: ..... 299
  median: ..... 284.3
  p95: ..... 284.3
  p99: ..... 284.3
plugins.metrics-by-endpoint.response_time./tukano-1/rest/users/:
  min: ..... 282
  max: ..... 282
  mean: ..... 282
  median: ..... 284.3
  p95: ..... 284.3
  p99: ..... 284.3
plugins.metrics-by-endpoint.response_time./tukano-1/rest/users/admin?pwd=admin:
  min: ..... 274
  max: ..... 299
  mean: ..... 279.7
  median: ..... 278.7
  p95: ..... 278.7
  p99: ..... 278.7
vusers.completed: ..... 20
vusers.created: ..... 30
vusers.created_by_name.Download short: ..... 8
vusers.created_by_name.Follow user: ..... 2
vusers.created_by_name.Get Short Likes: ..... 2
vusers.created_by_name.Like short: ..... 1
vusers.created_by_name.Register user: ..... 1
vusers.created_by_name.Upload short: ..... 1
vusers.created_by_name.View feed: ..... 15
vusers.failed: ..... 10

```

vusers.session_length:
 min: 554.2
 max: 1743
 mean: 636
 median: 561.2
 p95: 699.4
 p99: 699.4

User delete

http.codes.200: 200
 http.downloaded_bytes: 22370
 http.request_rate: 2/sec
 http.requests: 200
 http.response_time:
 min: 271
 max: 316
 mean: 284
 median: 284.3
 p95: 290.1
 p99: 301.9
 http.response_time.2xx:
 min: 271
 max: 316
 mean: 284
 median: 284.3
 p95: 290.1
 p99: 301.9
 http.responses: 200
 vusers.completed: 200
 vusers.created: 200
 vusers.created_by_name.TuKanoDeleteUserFlow: 200
 vusers.failed: 0
 vusers.session_length:
 min: 552.2
 max: 627.2
 mean: 562.7
 median: 561.2
 p95: 572.6
 p99: 584.2

North Europe

Post User

http.codes.200: 50
 http.downloaded_bytes: 291
 http.request_rate: 1/sec
 http.requests: 50
 http.response_time:
 min: 49
 max: 318
 mean: 60.9
 median: 53
 p95: 58.6
 p99: 175.9
 http.response_time.2xx:
 min: 49
 max: 318
 mean: 60.9
 median: 53
 p95: 58.6
 p99: 175.9

```

http.responses: ..... 50
vusers.completed: ..... 50
vusers.created: ..... 50
vusers.created_by_name.TuKanoRegister: ..... 50
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 96.7
  max: ..... 492.5
  mean: ..... 119.7
  median: ..... 104.6
  p95: ..... 133
  p99: ..... 361.5

```

Get User

```

http.codes.200: ..... 100
http.downloaded_bytes: ..... 3800
http.request_rate: ..... 2/sec
http.requests: ..... 100
http.response_time:
  min: ..... 46
  max: ..... 59
  mean: ..... 49.8
  median: ..... 48.9
  p95: ..... 54.1
  p99: ..... 57.4
http.response_time.2xx:
  min: ..... 46
  max: ..... 59
  mean: ..... 49.8
  median: ..... 48.9
  p95: ..... 54.1
  p99: ..... 57.4
http.responses: ..... 100
vusers.completed: ..... 50
vusers.created: ..... 50
vusers.created_by_name.TuKanoGetUsers: ..... 50
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 143.4
  max: ..... 206.7
  mean: ..... 156.5
  median: ..... 156
  p95: ..... 169
  p99: ..... 186.8

```

Post Short

```

http.codes.200: ..... 100
http.downloaded_bytes: ..... 15448
http.request_rate: ..... 33/sec
http.requests: ..... 100
http.response_time:
  min: ..... 45
  max: ..... 58
  mean: ..... 51.2
  median: ..... 50.9
  p95: ..... 56.3
  p99: ..... 57.4
http.response_time.2xx:
  min: ..... 45
  max: ..... 58
  mean: ..... 51.2
  median: ..... 50.9
  p95: ..... 56.3
  p99: ..... 57.4
http.responses: ..... 100
plugins.metrics-by-endpoint./tukano-1/rest/shorts/user1?pwd=pass1.codes.200: ... 50

```

```

plugins.metrics-by-endpoint./tukano-1/rest/users/admin?pwd=admin.codes.200: .... 50
plugins.metrics-by-endpoint.response_time./tukano-1/rest/shorts/user1?pwd=pass1:
  min: ..... 51
  max: ..... 58
  mean: ..... 53.9
  median: ..... 54.1
  p95: ..... 57.4
  p99: ..... 57.4
plugins.metrics-by-endpoint.response_time./tukano-1/rest/users/admin?pwd=admin:
  min: ..... 45
  max: ..... 54
  mean: ..... 48.4
  median: ..... 47.9
  p95: ..... 51.9
  p99: ..... 53
vusers.completed: ..... 50
vusers.created: ..... 50
vusers.created_by_name.TuKanoPostShort: ..... 50
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 141.4
  max: ..... 176.8
  mean: ..... 149.4
  median: ..... 149.9
  p95: ..... 156
  p99: ..... 159.2

```

Get Short

```

http.codes.200: ..... 100
http.downloaded_bytes: ..... 14849
http.request_rate: ..... 26/sec
http.requests: ..... 100
http.response_time:
  min: ..... 45
  max: ..... 62
  mean: ..... 49.9
  median: ..... 49.9
  p95: ..... 55.2
  p99: ..... 61
http.response_time.2xx:
  min: ..... 45
  max: ..... 62
  mean: ..... 49.9
  median: ..... 49.9
  p95: ..... 55.2
  p99: ..... 61
http.responses: ..... 100
vusers.completed: ..... 50
vusers.created: ..... 50
vusers.created_by_name.TuKanoGetShort: ..... 50
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 137.2
  max: ..... 172.8
  mean: ..... 147.7
  median: ..... 147
  p95: ..... 156
  p99: ..... 165.7

```

User Register

```

http.codes.200: ..... 600
http.downloaded_bytes: ..... 47137
http.request_rate: ..... 6/sec
http.requests: ..... 600

```

```

http.response_time:
  min: ..... 45
  max: ..... 92
  mean: ..... 54.1
  median: ..... 54.1
  p95: ..... 59.7
  p99: ..... 67.4
http.response_time.2xx:
  min: ..... 45
  max: ..... 92
  mean: ..... 54.1
  median: ..... 54.1
  p95: ..... 59.7
  p99: ..... 67.4
http.responses: ..... 600
plugins.metrics-by-endpoint./tukano-1/rest/users/.codes.200: ..... 200
plugins.metrics-by-endpoint./tukano-1/rest/users/{{ userId }}?pwd={{ pwd }}:.... 400
plugins.metrics-by-endpoint.response_time./tukano-1/rest/users/:
  min: ..... 50
  max: ..... 69
  mean: ..... 54.4
  median: ..... 54.1
  p95: ..... 58.6
  p99: ..... 63.4
plugins.metrics-by-endpoint.response_time./tukano-1/rest/users/{{ userId }}?pwd={{ pwd }}:
  min: ..... 45
  max: ..... 92
  mean: ..... 53.9
  median: ..... 53
  p95: ..... 59.7
  p99: ..... 77.5
vusers.completed: ..... 200
vusers.created: ..... 200
vusers.created_by_name.TuKanoWholeUserFlow: ..... 200
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 200.1
  max: ..... 270.8
  mean: ..... 218.5
  median: ..... 214.9
  p95: ..... 232.8
  p99: ..... 257.3

```

Upload Shorts

```

http.codes.200: ..... 60
http.codes.204: ..... 30
http.downloaded_bytes: ..... 10019
http.request_rate: ..... 10/sec
http.requests: ..... 90
http.response_time:
  min: ..... 46
  max: ..... 698
  mean: ..... 90.4
  median: ..... 55.2
  p95: ..... 156
  p99: ..... 202.4
http.response_time.2xx:
  min: ..... 46
  max: ..... 698
  mean: ..... 90.4
  median: ..... 55.2
  p95: ..... 156
  p99: ..... 202.4
http.responses: ..... 90
plugins.metrics-by-endpoint./tukano-1/rest/blobs/{{ blobUrl }}.codes.204: ..... 30

```

```

plugins.metrics-by-endpoint./tukano-1/rest/shorts/{{ userId }}?pwd={{ pwd }}... 30
plugins.metrics-by-endpoint./tukano-1/rest/users/admin?pwd=admin.codes.200: .... 30
plugins.metrics-by-endpoint.response_time./tukano-1/rest/blobs/{{ blobUrl }}:
  min: ..... 100
  max: ..... 698
  mean: ..... 166.2
  median: ..... 149.9
  p95: ..... 198.4
  p99: ..... 202.4
plugins.metrics-by-endpoint.response_time./tukano-1/rest/shorts/{{ userId }}?pwd={{ pwd }}:
  min: ..... 50
  max: ..... 66
  mean: ..... 55.2
  median: ..... 55.2
  p95: ..... 62.2
  p99: ..... 63.4
plugins.metrics-by-endpoint.response_time./tukano-1/rest/users/admin?pwd=admin:
  min: ..... 46
  max: ..... 56
  mean: ..... 49.9
  median: ..... 49.9
  p95: ..... 53
  p99: ..... 55.2
vusers.completed: ..... 30
vusers.created: ..... 30
vusers.created_by_name.Upload short: ..... 30
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 260.2
  max: ..... 897.2
  mean: ..... 336.4
  median: ..... 314.2
  p95: ..... 368.8
  p99: ..... 383.8

```

Realistic Flow

```

errors.Cannot read properties of undefined (reading 'ownerId'): ..... 7
http.codes.200: ..... 7
http.codes.204: ..... 4
http.codes.401: ..... 3
http.codes.500: ..... 16
http.downloaded_bytes: ..... 5650
http.request_rate: ..... 4/sec
http.requests: ..... 30
http.response_time:
  min: ..... 48
  max: ..... 98
  mean: ..... 54.3
  median: ..... 50.9
  p95: ..... 67.4
  p99: ..... 68.7
http.response_time.2xx:
  min: ..... 49
  max: ..... 68
  mean: ..... 53.1
  median: ..... 50.9
  p95: ..... 58.6
  p99: ..... 58.6
http.response_time.4xx:
  min: ..... 50
  max: ..... 63
  mean: ..... 55.7

```

```

median: ..... 54.1
p95: ..... 54.1
p99: ..... 54.1
http.response_time.5xx:
  min: ..... 48
  max: ..... 98
  mean: ..... 54.9
  median: ..... 49.9
  p95: ..... 68.7
  p99: ..... 68.7
http.responses: ..... 30
plugins.metrics-by-endpoint./tukano-1/rest/shorts/{{ userId }}/feed?pwd={{ p... 16
plugins.metrics-by-endpoint./tukano-1/rest/shorts/{{ userId }}/shorts.codes.... 3
plugins.metrics-by-endpoint./tukano-1/rest/shorts/{{ userId1 }}/{{ userId2 }}... 4
plugins.metrics-by-endpoint./tukano-1/rest/users/admin?pwd=admin.codes.200: .... 7
plugins.metrics-by-endpoint.response_time./tukano-1/rest/shorts/{{ userId }}/feed?pwd={{ pwd }}:
  min: ..... 48
  max: ..... 98
  mean: ..... 54.9
  median: ..... 49.9
  p95: ..... 68.7
  p99: ..... 68.7
plugins.metrics-by-endpoint.response_time./tukano-1/rest/shorts/{{ userId }}/shorts:
  min: ..... 50
  max: ..... 63
  mean: ..... 55.7
  median: ..... 54.1
  p95: ..... 54.1
  p99: ..... 54.1
plugins.metrics-by-endpoint.response_time./tukano-1/rest/shorts/{{ userId1 }}/{{ userId2 }}/followers?pwd={{ pwd }}:
  min: ..... 51
  max: ..... 68
  mean: ..... 57.8
  median: ..... 54.1
  p95: ..... 58.6
  p99: ..... 58.6
plugins.metrics-by-endpoint.response_time./tukano-1/rest/users/admin?pwd=admin:
  min: ..... 49
  max: ..... 52
  mean: ..... 50.4
  median: ..... 50.9
  p95: ..... 51.9
  p99: ..... 51.9
vusers.completed: ..... 23
vusers.created: ..... 30
vusers.created_by_name.Download short: ..... 4
vusers.created_by_name.Follow user: ..... 4
vusers.created_by_name.Get Short Likes: ..... 3
vusers.created_by_name.Get User's Shorts: ..... 3
vusers.created_by_name.View feed: ..... 16
vusers.failed: ..... 7
vusers.session_length:
  min: ..... 96.1
  max: ..... 180.4
  mean: ..... 119.3
  median: ..... 111.1
  p95: ..... 159.2
  p99: ..... 175.9

```

Delete Users

```

http.codes.200: ..... 200
http.downloaded_bytes: ..... 22370
http.request_rate: ..... 2/sec
http.requests: ..... 200
http.response_time:
  min: ..... 51

```

```

max: ..... 147
mean: ..... 58.1
median: ..... 56.3
p95: ..... 67.4
p99: ..... 89.1
http.response_time.2xx:
  min: ..... 51
  max: ..... 147
  mean: ..... 58.1
  median: ..... 56.3
  p95: ..... 67.4
  p99: ..... 89.1
http.responses: ..... 200
vusers.completed: ..... 200
vusers.created: ..... 200
vusers.created_by_name.TuKanoDeleteUserFlow: ..... 200
vusers.failed: ..... 0
vusers.session_length:
  min: ..... 98.4
  max: ..... 204.9
  mean: ..... 109.6
  median: ..... 106.7
  p95: ..... 125.2
  p99: ..... 149.9

```