

# expoQA<sup>®</sup>

MADRID 17<sup>th</sup> to 19<sup>th</sup> of JUNE 2019



International Software Testing & Quality Engineering Conference

# Testing cloud and kubernetes applications

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International Software Testing & Qua



MADRID 17<sup>th</sup> to 19<sup>th</sup> of JUNE 2019



<https://elastest.io/expoqa19>

# About us

expo **CAIS**  
MADRID 17<sup>th</sup> to 19<sup>th</sup> of JUNE 2019

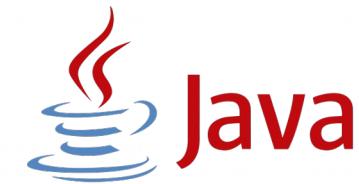


 @micael\_gallego

 micael.gallego@urjc.es

 @micaelgallego

# developers university professors trainers, consultants



**Jenkins**



**kubernetes**



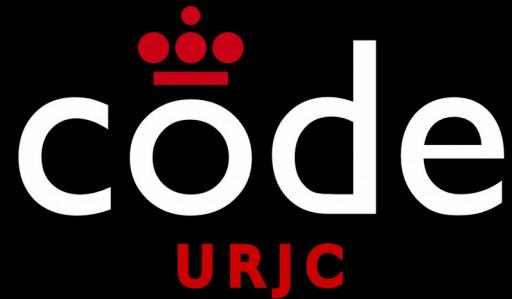
 @fgortazar



 francisco.gortazar@urjc.es



 @gortazar



SOFTWARE  
LABORATORY

## PRODUCTS



## MASTER CLOUD APPS

Software quality  
Backend technologies  
Cloud & containers  
CI / CD

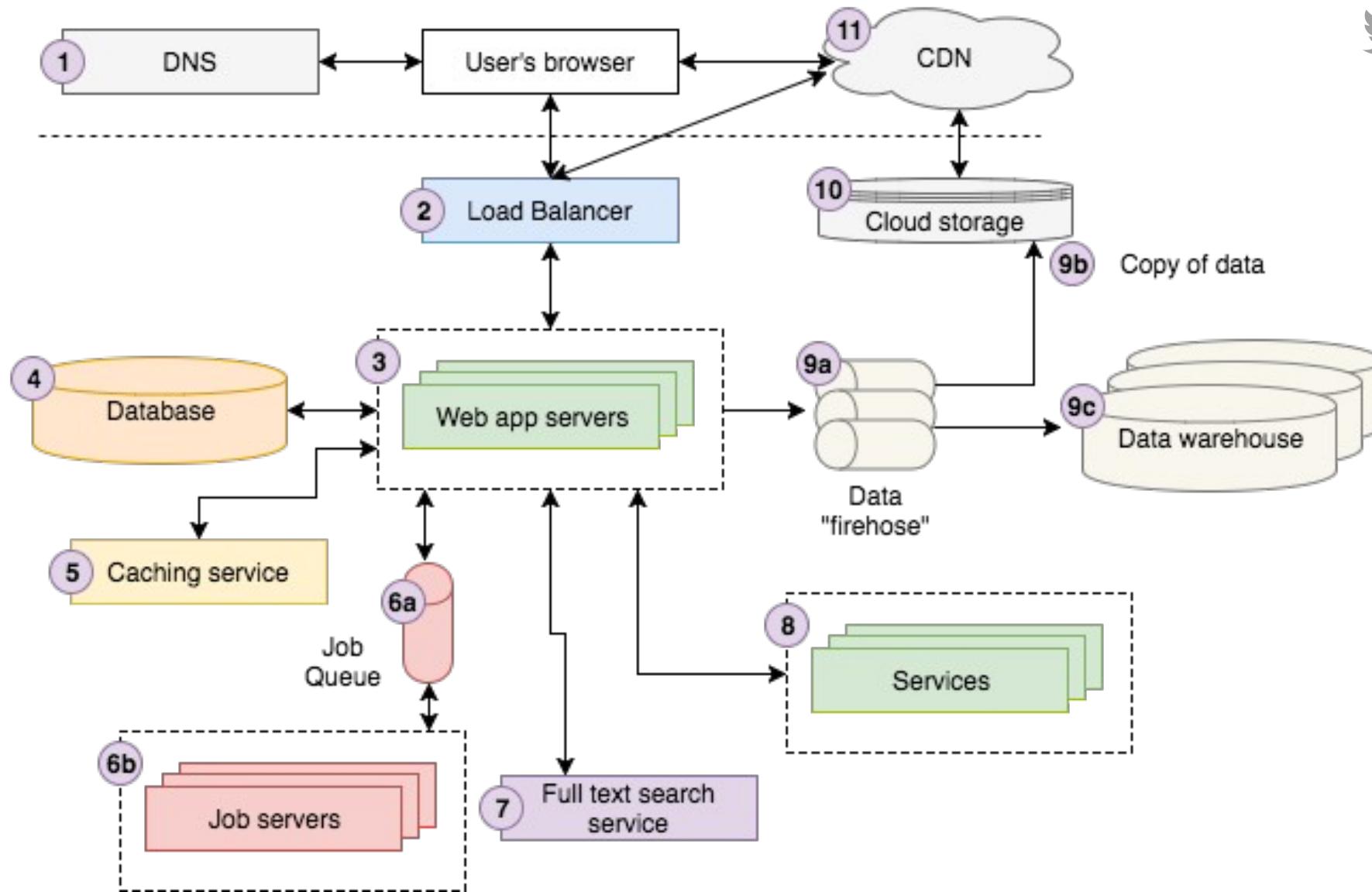
**100% Online / 1 año**

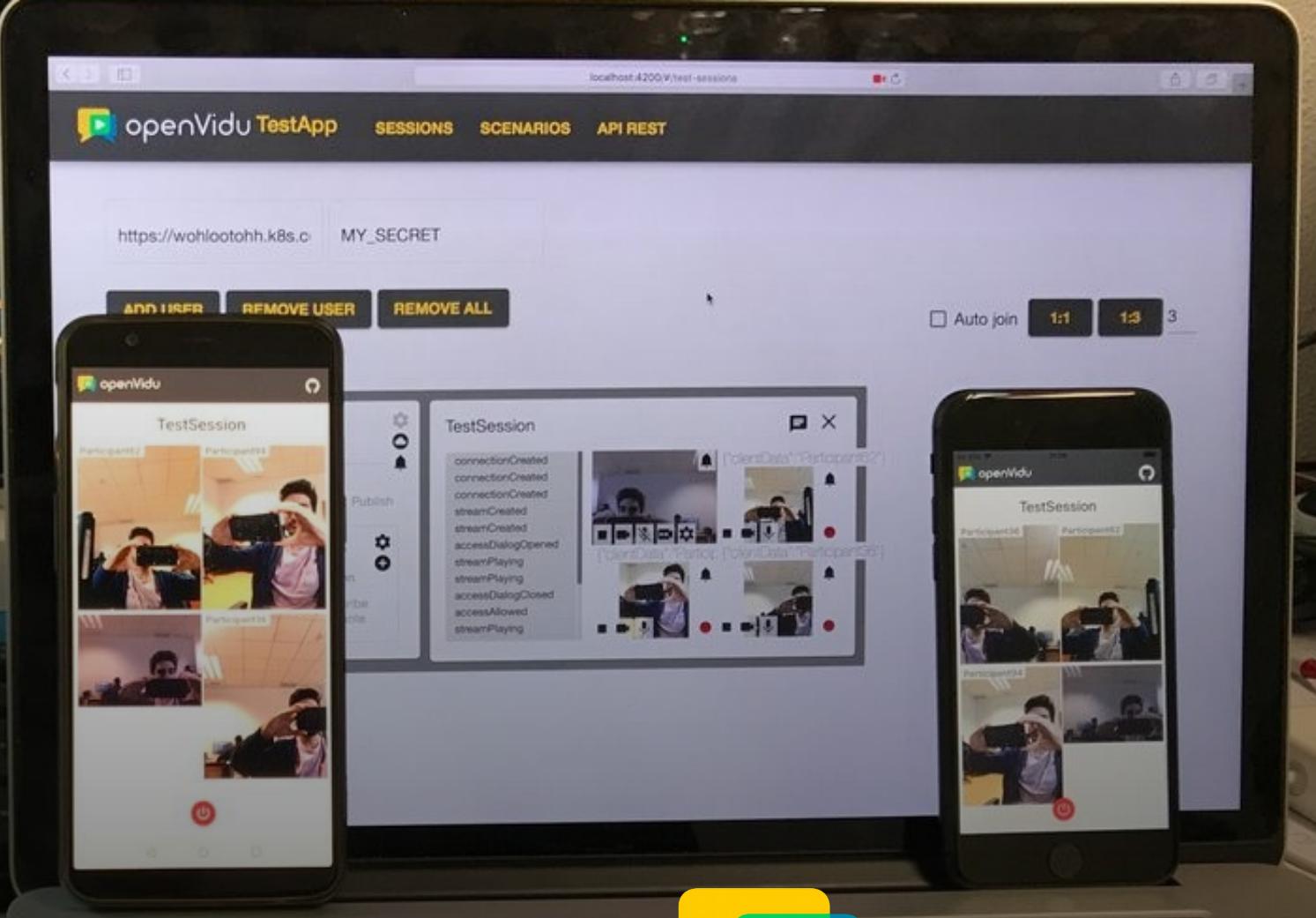
## CONSULTANCY & TRAINING

Cloud Computing & Microservices  
Testing / Git / Jenkins / CI  
Web Technologies & APIs  
Extreme Programming  
Concurrent & Distributed Systems  
Software Architecture



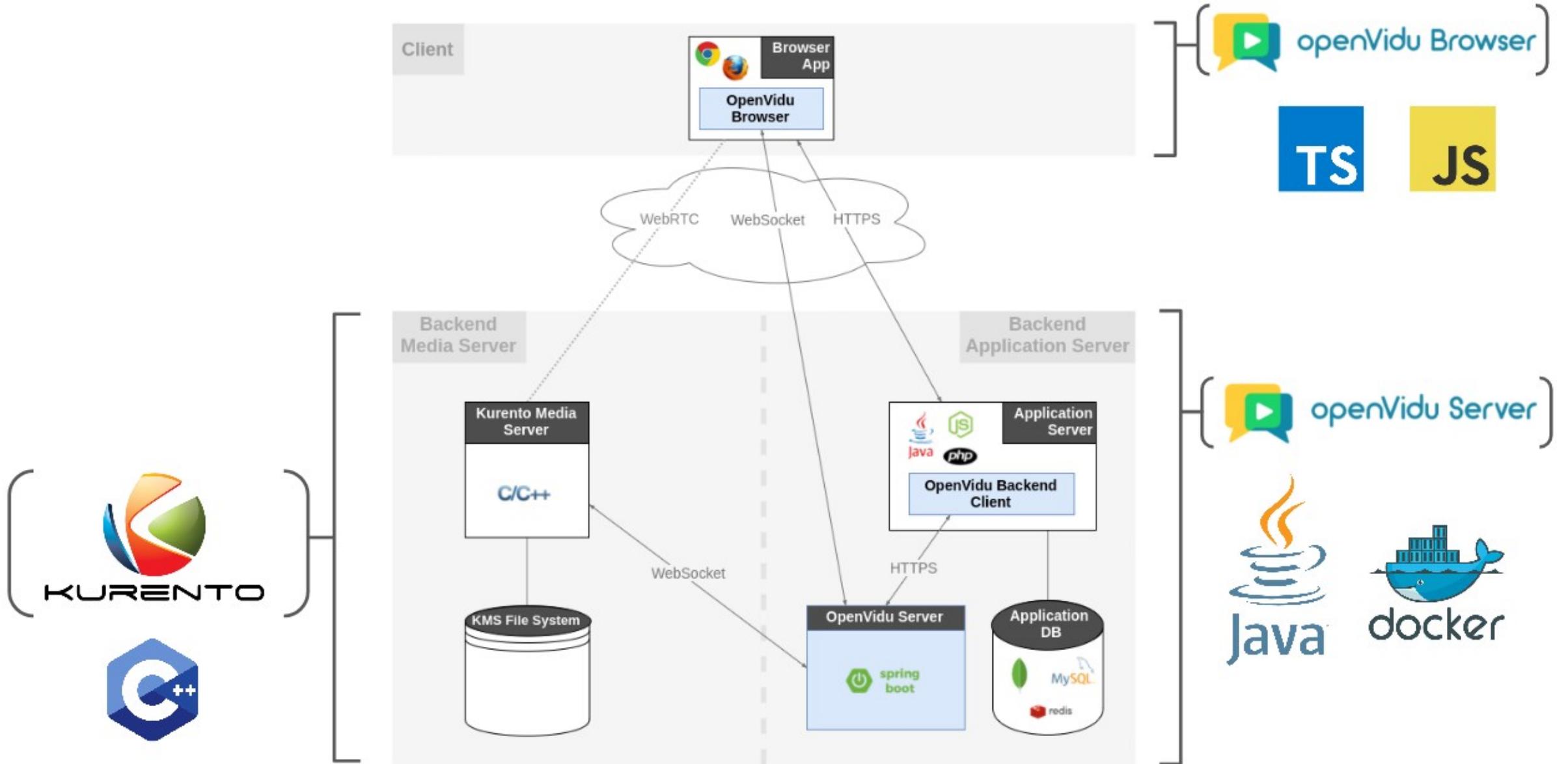
# Cloud native applications





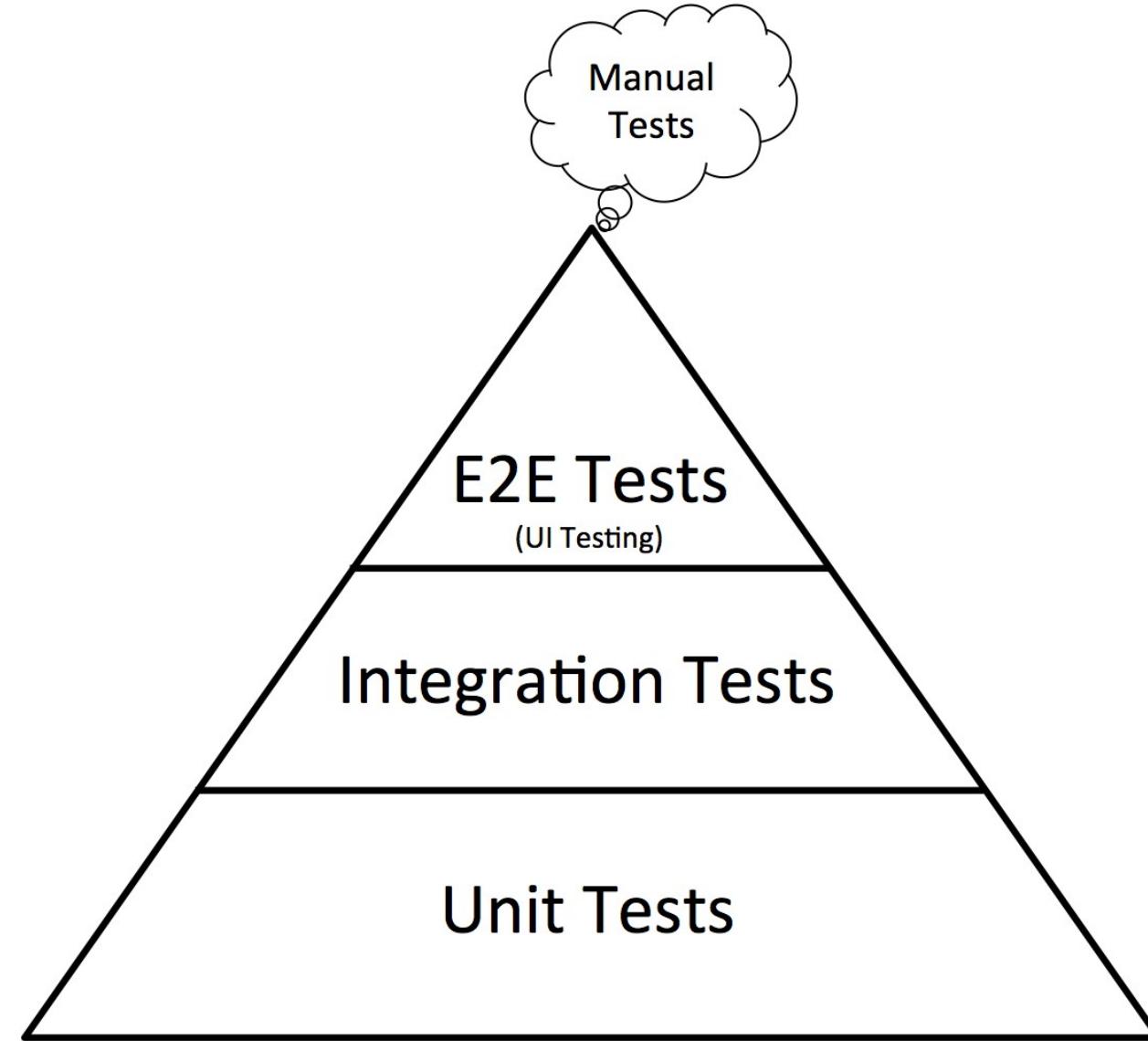
# openVidu

# Cloud native applications

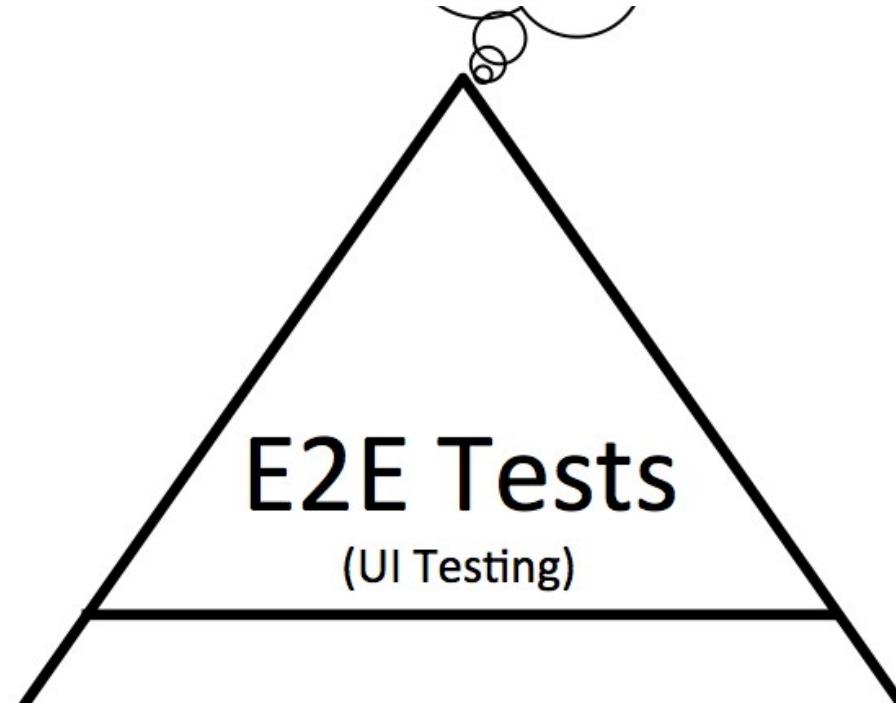


# Testing

- We need tests to assure their quality



# Testing



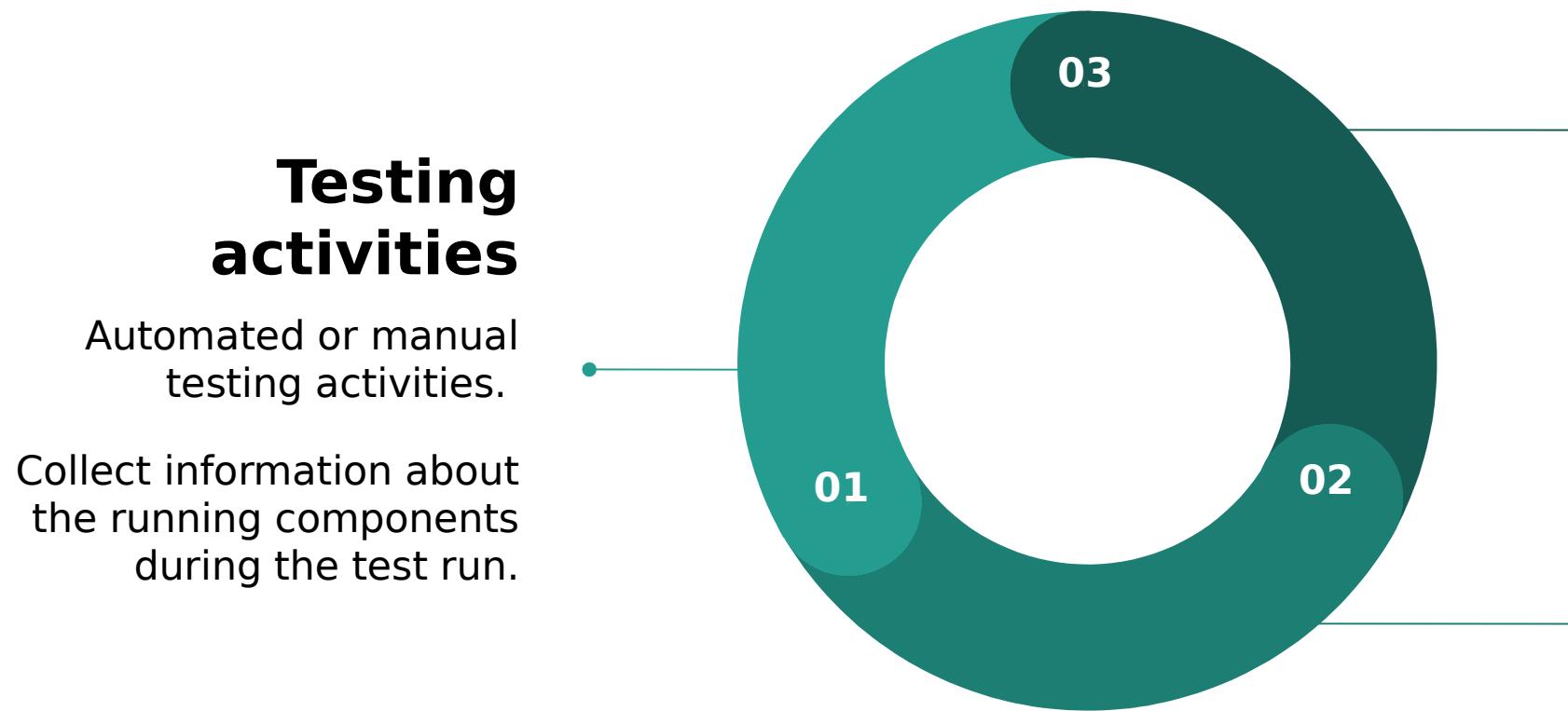
E2E testing of complex cloud native  
apps is a big challenge



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# How's the testing process?

# How's the testing process?



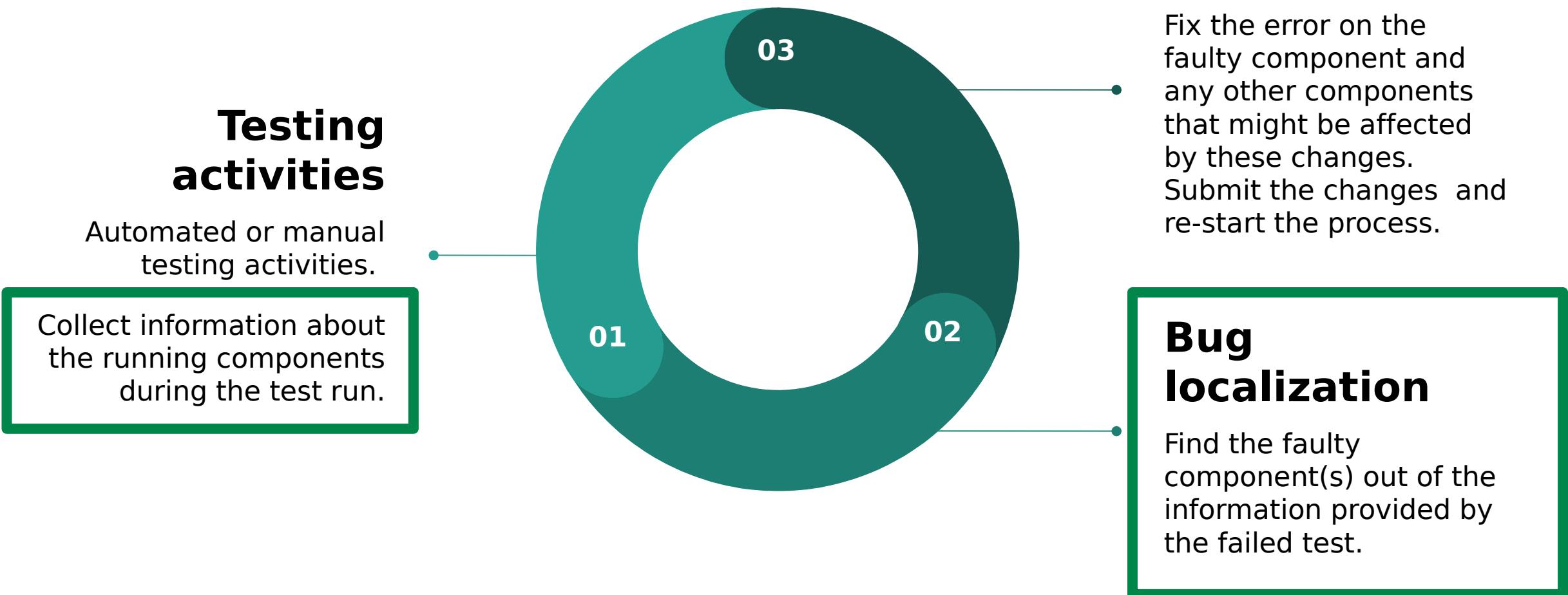
## Fixing

Fix the error on the faulty component and any other components that might be affected by these changes. Submit the changes and re-start the process.

## Bug localization

Find the faulty component(s) out of the information provided by the failed test.

# How's the testing process?





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# Solution: Observability + Analytics!!



*“In control theory, **observability** is a measure of how well **internal states** of a system can be inferred from knowledge of its **external outputs**.”*

(Wikipedia)



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This is what we usually do in  
**production**

- BREAK DOWN  
 endpoint\_shape

fx CALCULATE PER GROUP  
 MAX(durationMs)  
 HEATMAP(durationMs)

▽ FILTER MATCH ALL OF:  
 parentId does-not-exist  
 durationMs < 1200

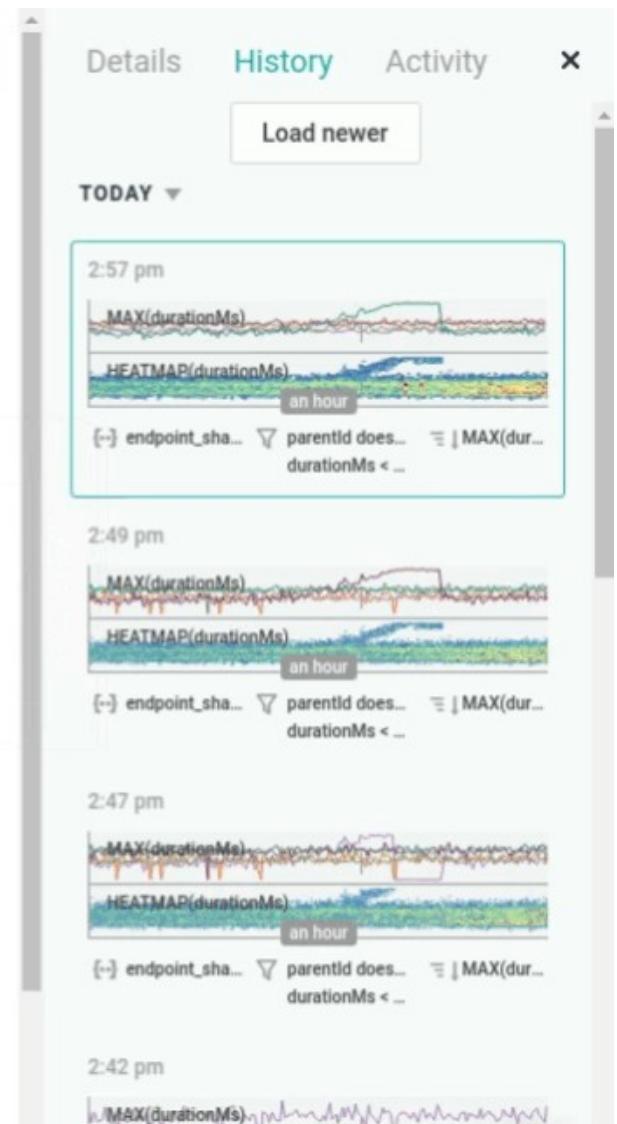
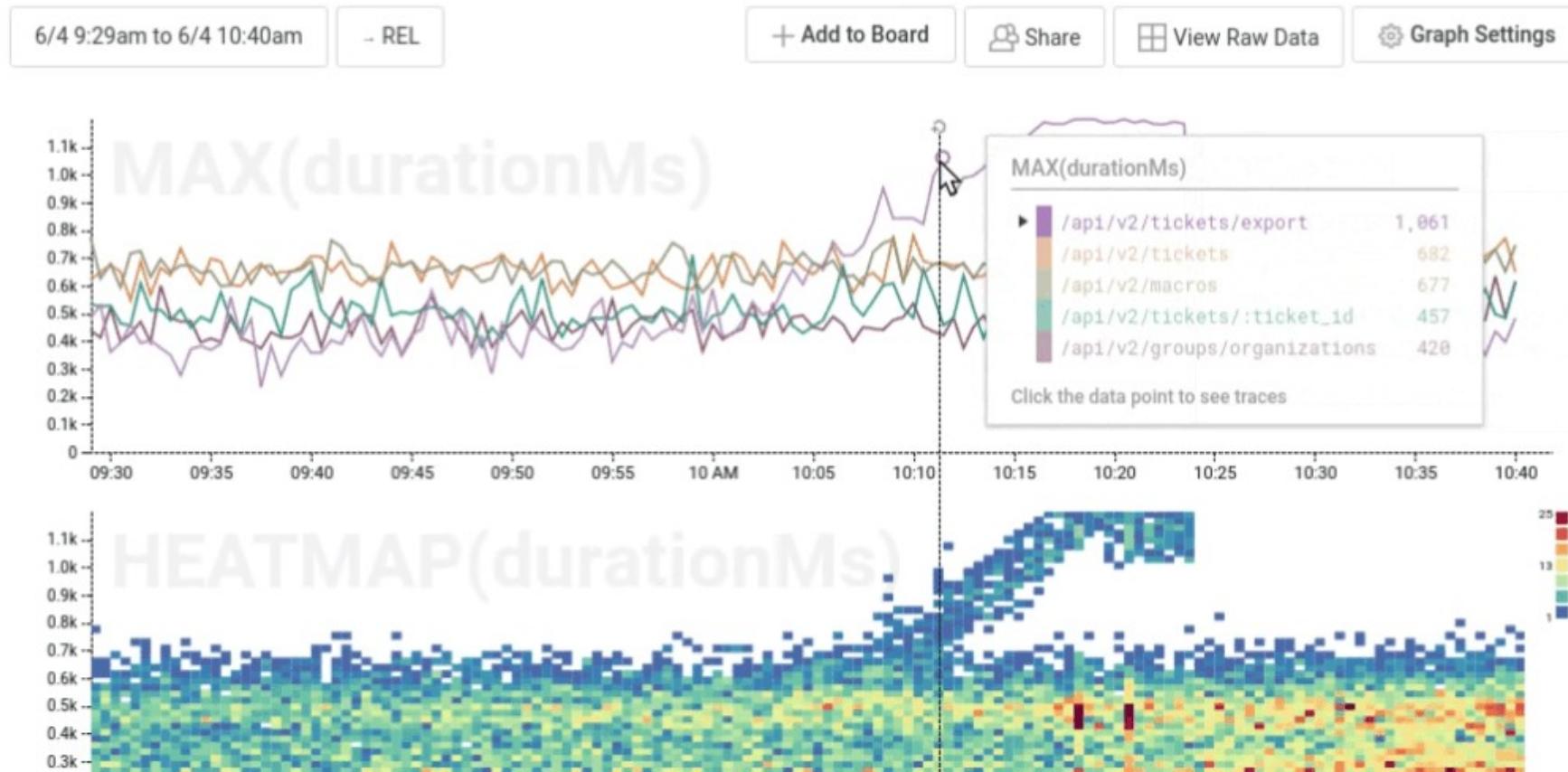
≡ ORDER  
 MAX(durationMs) desc

L LIMIT  
 5

**Run Query**

Run 6 minutes ago

Query at 6/4 2:57PM (Click to edit)



Source: honeycomb.io



# How to know the root cause of the problem when an e2e test fails?

# How CI server help us?



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Jenkins

Jenkins > Suisse > Stop-tabac dev

[Back to Dashboard](#)

[Status](#)

[Changes](#)

[Workspace](#)

[Build Now](#)

[Delete Project](#)

[Configure](#)

[Set Next Build Number](#)

[Duplicate Code](#)

[Coverage Report](#)

[SLOCCount](#)

[Git Polling Log](#)

**Project Stop-tabac dev**

CI build

[Coverage Report](#)

[Workspace](#)

[Recent Changes](#)

[Latest Test Result \(no failures\)](#)

**Permalinks**

- [Last build \(#977\), 3 min 17 sec ago](#)
- [Last stable build \(#977\), 3 min 17 sec ago](#)

**Test Result Trend**

The graph shows the count of test results over time. The x-axis represents build numbers: #90, #171, and #210. The y-axis represents the count, ranging from 0 to 140. A blue shaded area represents the trend, starting at approximately 10 for build #90, rising to about 50 for build #171, and reaching nearly 140 for build #210.

| Build | Count |
|-------|-------|
| #90   | ~10   |
| #171  | ~50   |
| #210  | ~135  |

Classes 45% Conditions 74%

# Build history

Build History [trend](#) =

find X

- [#16](#) May 5, 2016 11:14 AM
- [#15](#) May 5, 2016 11:11 AM
- [#14](#) May 5, 2016 11:09 AM
- [#13](#) May 5, 2016 11:09 AM
- [#12](#) May 5, 2016 10:58 AM
- [#11](#) May 5, 2016 10:56 AM
- [#10](#) May 5, 2016 10:51 AM
- [#9](#) May 5, 2016 10:41 AM
- [#8](#) May 4, 2016 6:15 PM
- [#7](#) May 4, 2016 6:14 PM
- [#6](#) May 4, 2016 6:12 PM
- [#5](#) May 4, 2016 6:11 PM
- [#4](#) May 4, 2016 6:05 PM
- [#3](#) May 4, 2016 6:00 PM
- [#2](#) May 4, 2016 5:56 PM
- [#1](#) May 4, 2016 5:50 PM

[!\[\]\(fd52e7add9a442aaa4ca7017b17360c5\_img.jpg\) RSS for all](#) [!\[\]\(37919d19afc63f14e440d2a44d4af43d\_img.jpg\) RSS for failures](#)



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# Build history divided by tests

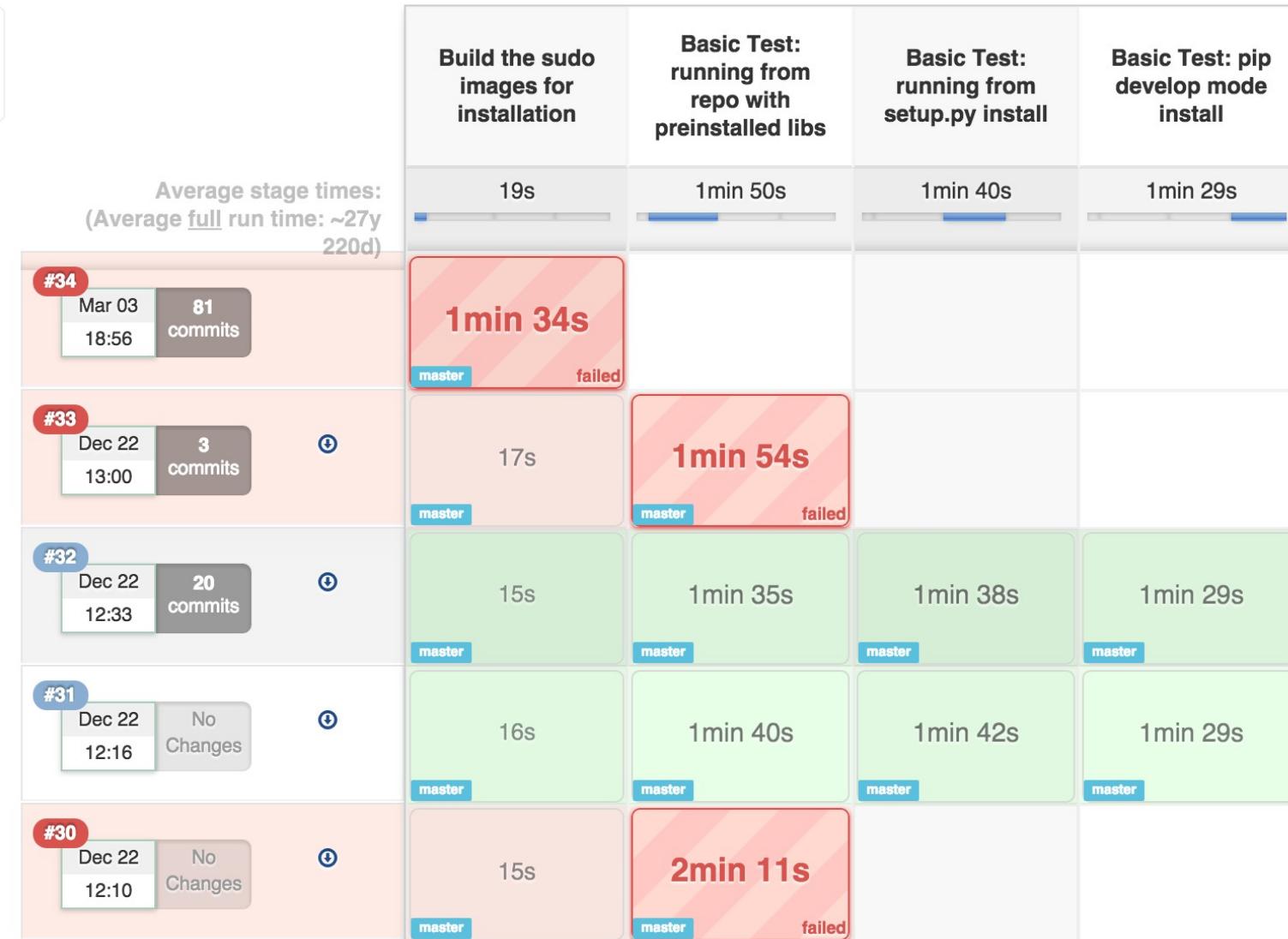


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| Chart | See children | Build Number ⇒<br>Package-Class-<br>Testmethod names ↓ | 16      | 15      | 14      | 13      | 12      | 11      | 10      | 9       | 8       | 7       | 6       | 5       |
|-------|--------------|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| ☐     | ⊖            | org.common.samplea                                     | FAILED  | N/A     |
| ☐     | ⊖            | SampleATest  | FAILED  | N/A     |
| ☐     |              | testA  | PASSED  | N/A     |
| ☐     |              | testB  | PASSED  | N/A     |
| ☐     |              | testC  | FAILED  | N/A     |
| ☐     |              | testD  | PASSED  | N/A     |
| ☐     | ⊕            | org.common.sampleb                                     | FAILED  | N/A     |
| ☐     | ⊖            | org.common.samplec                                     | PASSED  | N/A     |
| ☐     | ⊖            | SampleDTest  | PASSED  | N/A     |
| ☐     |              | testA  | PASSED  |
| ☐     |              | testB  | SKIPPED |
| ☐     |              | testC  | SKIPPED |
| ☐     |              | testD  | PASSED  |



# Build history divided by job steps



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# Job execution logs

```
Start execution of test set: Root\Jenkins\testrunner
Run mode: LOCAL
Host name: 111-TOSH
Test: [1]run me, Execution status: WAITING, Message: Waiting...
Test: [1]run me, Execution status: UNKNOWN, Message: Host connected
Test: [1]run me, Execution status: RUNNING, Message: Running...
Test: [1]run me, Execution status: PASSED, Message: Passed
Execution has finished. Processing execution results
Test name: [1]run me, Message: Passed, Status: FinishedPassed
Writing C:\temp\Jenkins\slave1\workspace\Bumblebee_plugin_demo\TestSet_Runner_Test\bumblebee_junit\Root_Jenkins_testrunner_1467987908760.xml
Running test set: Root\Jenkins\testrunner1
Start execution of test set: Root\Jenkins\testrunner1
Run mode: LOCAL
Host name: 111-TOSH
Test: [1]fail, Execution status: WAITING, Message: Waiting...
Test: [1]fail, Execution status: CONNECTING, Message: Connecting...
Test: [1]fail, Execution status: UNKNOWN, Message: Host connected
Test: [1]fail, Execution status: RUNNING, Message: Running...
Test: [1]fail, Execution status: FAILED, Message: Failed
Test: [1]run me, Execution status: CONNECTING, Message: Connecting...
Test: [1]run me, Execution status: UNKNOWN, Message: Host connected
Test: [1]run me, Execution status: RUNNING, Message: Running...
Test: [1]run me, Execution status: PASSED, Message: Passed
Execution has finished. Processing execution results
Test name: [1]fail, Message: Failed, Status: FinishedFailed
Test name: [1]run me, Message: Passed, Status: FinishedPassed
Writing C:\temp\Jenkins\slave1\workspace\Bumblebee_plugin_demo\TestSet_Runner_Test\bumblebee_junit\Root_Jenkins_testrunner1_1467987960000
BumblebeeTestRunner finished successfully
Some of tests failed, check JUnit reports
Return code: 1
ERROR: Test set execution failed. See logs for details.
Recording test results
Finished: FAILURE
```



# Limitations of logs in CI Servers

```
Start execution of test set: Root\Jenkins\  
Run mode: LOCAL  
Host name: 111-TOSH  
Test: [1]run me, Execution status: WAITING  
Test: [1]run me, Execution status: UNKNOWN  
Test: [1]run me, Execution status: RUNNING  
Test: [1]run me, Execution status: PASSED,  
Execution has finished. Processing executi  
Test name: [1]run me, Message: Passed, Sta  
Writing C:\temp\Jenkins\slave1\workspace\B  
Running test set: Root\Jenkins\testrunner1  
Start execution of test set: Root\Jenkins\  
Run mode: LOCAL  
Host name: 111-TOSH  
Test: [1]fail, Execution status: WAITING,  
Test: [1]fail, Execution status: CONNECTIN  
Test: [1]fail, Execution status: UNKNOWN,  
Test: [1]fail, Execution status: RUNNING,  
Test: [1]fail, Execution status: FAILED, M  
Test: [1]run me, Execution status: CONNECT  
Test: [1]run me, Execution status: UNKNOWN  
Test: [1]run me, Execution status: RUNNING  
Test: [1]run me, Execution status: PASSED,  
Execution has finished. Processing executi  
Test name: [1]fail, Message: Failed, Statu  
Test name: [1]run me, Message: Passed, Sta  
Writing C:\temp\Jenkins\slave1\workspace\B  
BumblebeeTestSetRunner finished successful  
Some of tests failed, check JUnit reports  
Return code: 1  
ERROR: Test set execution failed. See logs  
Recording test results  
Finished: FAILURE
```

- One huge log for all job execution
  - Dependencies downloading
  - Compiling process
  - Package process
  - System deploying
  - Finally.... test logs!



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# Limitations of logs in CI Servers

```
Start execution of test set: Root\Jenkins\  
Run mode: LOCAL  
Host name: 111-TOSH  
Test: [1]run me, Execution status: WAITING  
Test: [1]run me, Execution status: UNKNOWN  
Test: [1]run me, Execution status: RUNNING  
Test: [1]run me, Execution status: PASSED,  
Execution has finished. Processing executi  
Test name: [1]run me, Message: Passed, Sta  
Writing C:\temp\Jenkins\slave1\workspace\B  
Running test set: Root\Jenkins\testrunner1  
Start execution of test set: Root\Jenkins\  
Run mode: LOCAL  
Host name: 111-TOSH  
Test: [1]fail, Execution status: WAITING,  
Test: [1]fail, Execution status: CONNECTIN  
Test: [1]fail, Execution status: UNKNOWN,  
Test: [1]fail, Execution status: RUNNING,  
Test: [1]fail, Execution status: FAILED, M  
Test: [1]run me, Execution status: CONNECT  
Test: [1]run me, Execution status: UNKNOWN  
Test: [1]run me, Execution status: RUNNING  
Test: [1]run me, Execution status: PASSED,  
Execution has finished. Processing executi  
Test name: [1]fail, Message: Failed, Statu  
Test name: [1]run me, Message: Passed, Sta  
Writing C:\temp\Jenkins\slave1\workspace\B  
BumblebeeTestSetRunner finished successful  
Some of tests failed, check JUnit reports  
Return code: 1  
ERROR: Test set execution failed. See logs  
Recording test results  
Finished: FAILURE
```

- Some test frameworks don't log when every individual test starts and ends in the job log
  - Is difficult to know the logs belonging to failed test
  - Developer has to include marks in the code
  - JUnit4 → @Rule
  - JUnit5 → @ExtendWith



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# Limitations of logs in CI Servers

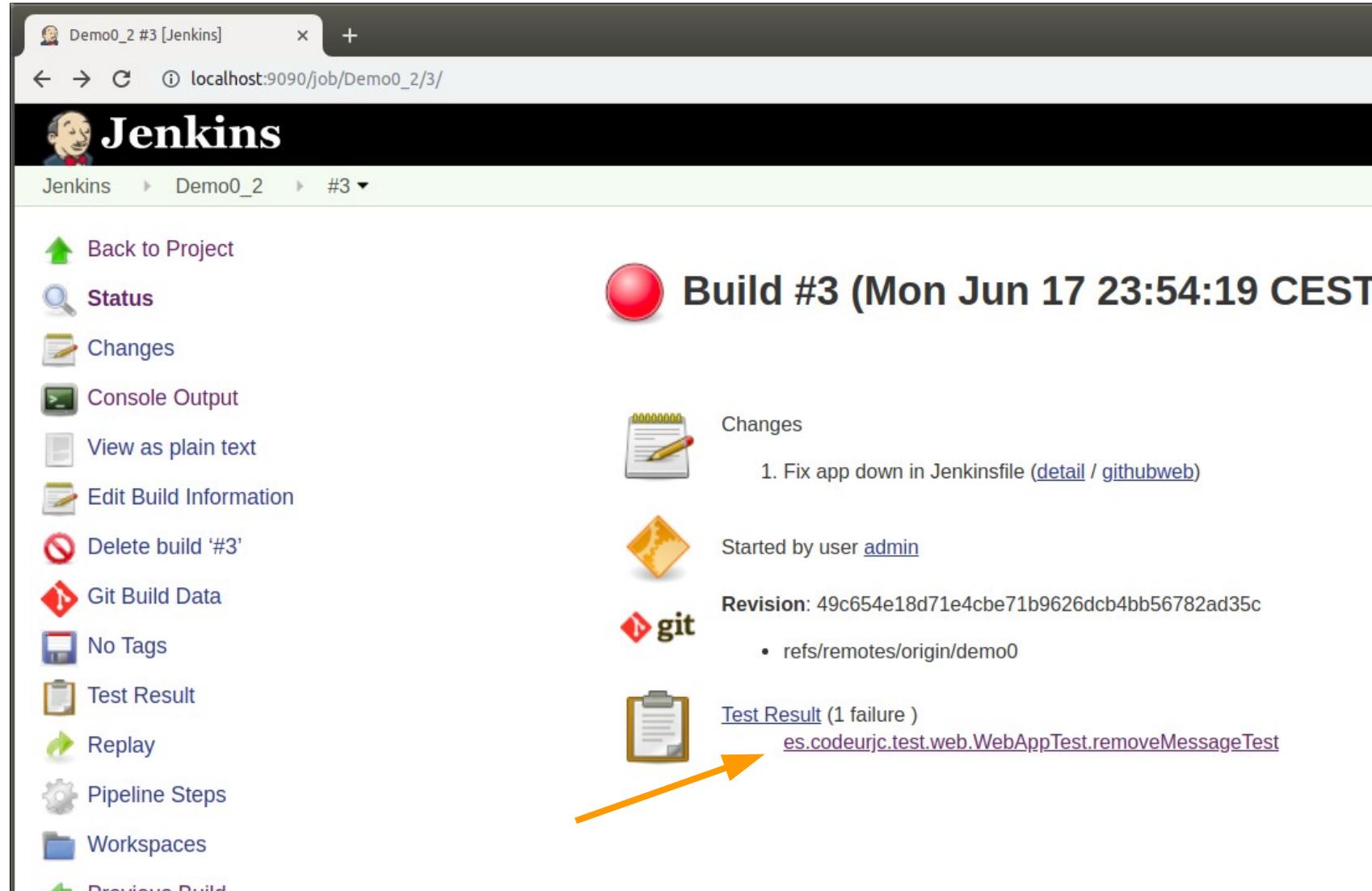
The screenshot shows a Jenkins build page for a project named 'FullTeaching BUG11'. The build number is #1, and it was run on April 4, 2018, at 12:04:33. The status is shown as a red circle with a white exclamation mark. The page includes a sidebar with various Jenkins management links like 'Back to Project', 'Status', and 'Console Output'. The main content area displays 'Build Artifacts' (a box icon) with four files: 'all-logs.txt' (779.97 KB), 'full-teaching-app.txt' (55.77 KB), 'mysql.txt' (25.89 KB), and 'openvidu.txt' (698.34 KB). Below that, there's information about the build initiator ('Iniciado por el usuario admin') and the git revision ('Revision: d55fc219f84f936b203e6d35c79a37b440424eb5'). A large orange arrow points from the text 'Some testing frameworks add test log in test report file and it is show in test page' to the 'Resultados de los tests' section, which lists a single failure: 'E2E tests for FullTeaching REST CRUD operations forumRestOperati'.

Some testing frameworks add **test log** in test report file and it is show in test page



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# Limitations of logs in CI Servers



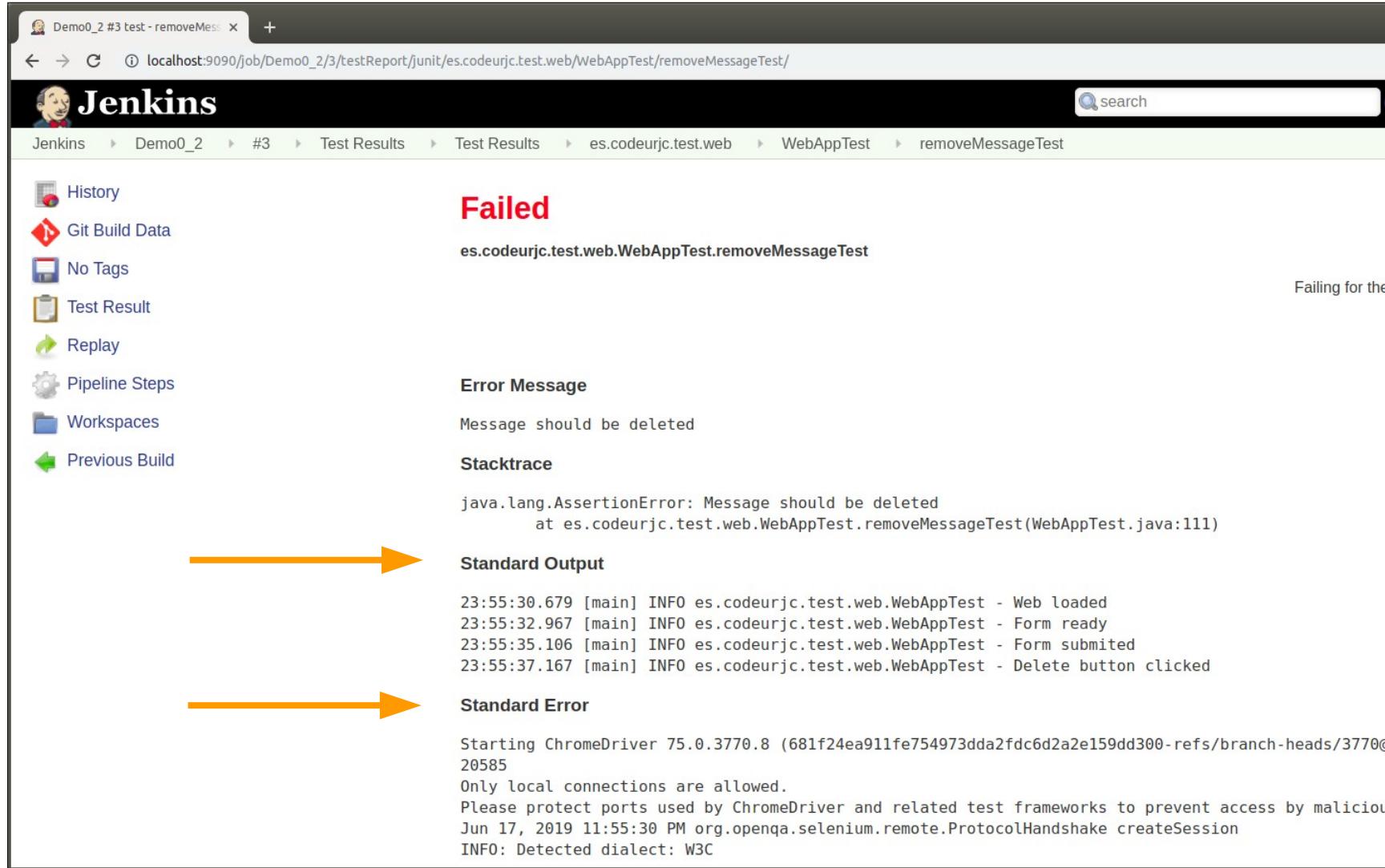
The screenshot shows the Jenkins interface for a job named 'Demo0\_2'. The current view is for build #3, which was run on Monday, June 17, at 23:54:19 CEST. The build status is indicated by a red circle icon. On the left, there is a sidebar with various navigation links: Back to Project, Status, Changes, Console Output, View as plain text, Edit Build Information, Delete build '#3', Git Build Data, No Tags, Test Result, Replay, Pipeline Steps, Workspaces, and Previous Build. The main content area displays the build details. It includes sections for Changes (listing a fix for the Jenkinsfile), Started by user (admin), Revision (git commit hash 49c654e18d71e4cbe71b9626dcb4bb56782ad35c, ref refs/remotes/origin/demo0), and Test Result (1 failure). An orange arrow points to the 'Test Result' section, highlighting the failure in the 'es.codeurjc.test.web.WebAppTest.removeMessageTest' test.

Some testing frameworks add **test log** in test report file and it is show in test page



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# Limitations of logs in CI Servers



The screenshot shows a Jenkins test report for a job named 'Demo0\_2' in run #3. The test name is 'es.codeurjc.test.web.WebAppTest.removeMessageTest'. The status is 'Failed'. The error message is 'Message should be deleted'. The stacktrace is:

```
java.lang.AssertionError: Message should be deleted
at es.codeurjc.test.web.WebAppTest.removeMessageTest(WebAppTest.java:111)
```

The standard output log shows:

```
23:55:30.679 [main] INFO es.codeurjc.test.web.WebAppTest - Web loaded
23:55:32.967 [main] INFO es.codeurjc.test.web.WebAppTest - Form ready
23:55:35.106 [main] INFO es.codeurjc.test.web.WebAppTest - Form submitted
23:55:37.167 [main] INFO es.codeurjc.test.web.WebAppTest - Delete button clicked
```

The standard error log shows:

```
Starting ChromeDriver 75.0.3770.8 (681f24ea911fe754973dda2fdc6d2a2e159dd300-refs/branch-heads/3770@20585
Only local connections are allowed.
Please protect ports used by ChromeDriver and related test frameworks to prevent access by malicious
Jun 17, 2019 11:55:30 PM org.openqa.selenium.remote.ProtocolHandshake createSession
INFO: Detected dialect: W3C
```

Two orange arrows point from the text 'Standard Output' and 'Standard Error' to their respective log sections in the Jenkins report.



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Some testing frameworks add **test log** in test report file and it is show in test page

# How do you analyze job log?



#expoQA19

- Using browser search tools (very limited)

FullTeaching GOLD x Micael

34.242.151.180/job/FullTeaching%20GOLD/12/console

Jenkins > FullTeaching GOLD > #12

sessionId 1/180

```
[32mfull-teaching-openvidu-server-kms_1 |[0m 0:03:55.255121399|[334m 9|[0m 0x7f029c001800|[37mDEBUG
|[0m|[0mKurentoWebRtcEndpointImpl WebRtcEndpointImpl.cpp:483:WebRtcEndpointImpl:|[0m TURN server IP address
not found in config; NAT traversal requires either STUN or TURN server
|[32mfull-teaching-openvidu-server-kms_1 |[0m 0:03:55.255121399|[334m 9|[0m 0x7f029c001800|[37mDEBUG
|[0m|[0mKurentoWebSocketTransport WebSocketTransport.cpp:424:processMessage:|[0m Response: >
{"id":280,"jsonrpc":"2.0","result":{"sessionId":"fb7898e1-193f-4bf4-ae54-b6536d2b14db","value":"e8751c11-fa13-
4229-9410-7a847495b6dd_kurento.MediaPipeline/32bab6ed-0cbe-45c8-85d4-f20478ecb3ef_kurento.WebRtcEndpoint"}}
|[32mfull-teaching-openvidu-server-kms_1 |[0m <
|[32mfull-teaching-openvidu-server-kms_1 |[0m
|[32mfull-teaching-openvidu-server-kms_1 |[0m 2018-02-20 16:15:31,022 DEBUG 'kms' stdout output:
|[32mfull-teaching-openvidu-server-kms_1 |[0m 0:03:55.256402515|[334m 9|[0m 0x7f0280001810|[37mDEBUG
|[0m|[0mKurentoWebSocketTransport WebSocketTransport.cpp:422:processMessage:|[0m Message: >
{"id":281,"method":"invoke","params":{"object":"e8751c11-fa13-4229-9410-
7a847495b6dd_kurento.MediaPipeline/32bab6ed-0cbe-45c8-85d4-
f20478ecb3ef_kurento.WebRtcEndpoint","operation":"setMaxVideoRecvBandwidth","operationParams":
{"maxVideoRecvBandwidth":600}, "sessionId":"fb7898e1-193f-4bf4-ae54-b6536d2b14db"}, "jsonrpc":"2.0"}<
|[32mfull-teaching-openvidu-server-kms_1 |[0m 0:03:55.256607423|[334m 9|[0m 0x7f0280001810|[37mDEBUG
|[0m|[0mKurentoWebSocketTransport WebSocketTransport.cpp:424:processMessage:|[0m Response: >
{"id":281,"jsonrpc":"2.0","result":{"sessionId":"fb7898e1-193f-4bf4-ae54-b6536d2b14db","value":null}}
|[32mfull-teaching-openvidu-server-kms_1 |[0m <
|[32mfull-teaching-openvidu-server-kms_1 |[0m
```

# Demo 0

Basic web app with database



<https://github.com/codeurjc/expoqa19/tree/demo0>

# Very basic SUT with 2 services



docker-compose

# Very basic SUT with 2 services



#expoQA19

- Jenkinsfile
  - 1) Clone repository
  - 2) Build app
  - 3) Start app
  - 4) E2E tests
  - 5) Shutdown app

```
node {  
    try {  
        stage("Preparation") {  
            git(  
                url: 'https://github.com/codeurjc/expoqa19.git', ← Clone repository  
                branch: "demo0"  
            )  
        }  
        stage("Create jar") {  
            sh "docker-compose build" ← Build app  
        }  
        stage("Start app") {  
            sh "docker-compose up -d" ← Start app  
        }  
        stage("Test") {  
            sh "mvn test" ← E2E Tests  
        }  
    } finally {  
        sh "docker-compose down" ← Shutdown app  
        junit "target/*-reports/TEST-*.xml"  
    }  
}
```



#expoQA19

# Where are SUT logs?

# Limitations of logs in CI Servers

```
Start execution of test set: Root\Jenkins\  
Run mode: LOCAL  
Host name: 111-TOSH  
Test: [1]run me, Execution status: WAITING  
Test: [1]run me, Execution status: UNKNOWN  
Test: [1]run me, Execution status: RUNNING  
Test: [1]run me, Execution status: PASSED,  
Execution has finished. Processing executi  
Test name: [1]run me, Message: Passed, Sta  
Writing C:\temp\Jenkins\slave1\workspace\B  
Running test set: Root\Jenkins\testrunner1  
Start execution of test set: Root\Jenkins\  
Run mode: LOCAL  
Host name: 111-TOSH  
Test: [1]fail, Execution status: WAITING,  
Test: [1]fail, Execution status: CONNECTIN  
Test: [1]fail, Execution status: UNKNOWN,  
Test: [1]fail, Execution status: RUNNING,  
Test: [1]fail, Execution status: FAILED, M  
Test: [1]run me, Execution status: CONNECT  
Test: [1]run me, Execution status: UNKNOWN  
Test: [1]run me, Execution status: RUNNING  
Test: [1]run me, Execution status: PASSED,  
Execution has finished. Processing executi  
Test name: [1]fail, Message: Failed, Statu  
Test name: [1]run me, Message: Passed, Sta  
Writing C:\temp\Jenkins\slave1\workspace\B  
BumblebeeTestSetRunner finished successful  
Some of tests failed, check JUnit reports  
Return code: 1  
ERROR: Test set execution failed. See logs  
Recording test results  
Finished: FAILURE
```

- Where are the **SUT logs?**

- In e2e tests, usually Jenkins only executes tests.
- SUT is executed **elsewhere**:
  - Cloud instances
  - Containers (Kubernetes, docker-compose...)
  - Plain old .jars?
- This logs have to be retrieved, stored...



#expoQA19



# Demo 1

Get and archive SUT logs



<https://github.com/codeurjc/expoqa19/tree/demo1>



#expoQA19

```
node {  
    try {  
        stage("Preparation") { ... }  
        stage("Create jar") { ... }  
        stage("Start app") { ... }  
        stage("Test") { ... }  
  
    } finally {  
  
        sh "docker-compose logs > all-logs.txt"  
        archive "all-logs.txt"  
  
        sh "docker-compose logs web > web-logs.txt"  
        archive "web-logs.txt"  
  
        sh "docker-compose logs db > db-logs.txt"  
        archive "db-logs.txt"  
  
    }  
}
```

Archive logs as files



# SUT Logs are available as a text files



#expoQA19

- One file for all logs
- One file per component

The screenshot shows the Jenkins interface for a build named 'Webapp2 #3 [Jenkins]'. The build was started 7 minutes 42 seconds ago and took 1 minute 50 seconds. The build number is #3, and it was run on Wednesday, June 12, at 16:42:54 CEST 2019. On the left, there's a sidebar with various options like 'Back to Project', 'Status', 'Changes', etc. In the center, under 'Build Artifacts', there are three files: 'all-logs.txt' (17.58 KB), 'db-logs.txt' (10.83 KB), and 'web-logs.txt' (6.76 KB). A yellow arrow points to the 'all-logs.txt' file. Below the artifacts, there's a section for 'Changes' with a note about using explicit webapp2 in Jenkinsfile.

| File         | Size     | Action               |
|--------------|----------|----------------------|
| all-logs.txt | 17.58 KB | <a href="#">view</a> |
| db-logs.txt  | 10.83 KB | <a href="#">view</a> |
| web-logs.txt | 6.76 KB  | <a href="#">view</a> |

Changes

1. Use explicit webapp2 in Jenkinsfile ([detail](#) / [githubweb](#))

SUT Logs are available as a text files



#expoQA19

# SUT Logs are available as a text files



```
localhost:8081/job/Webapp1/35/artifact/out.log

.
.
.
:: Spring Boot ::      (v2.1.3.RELEASE)

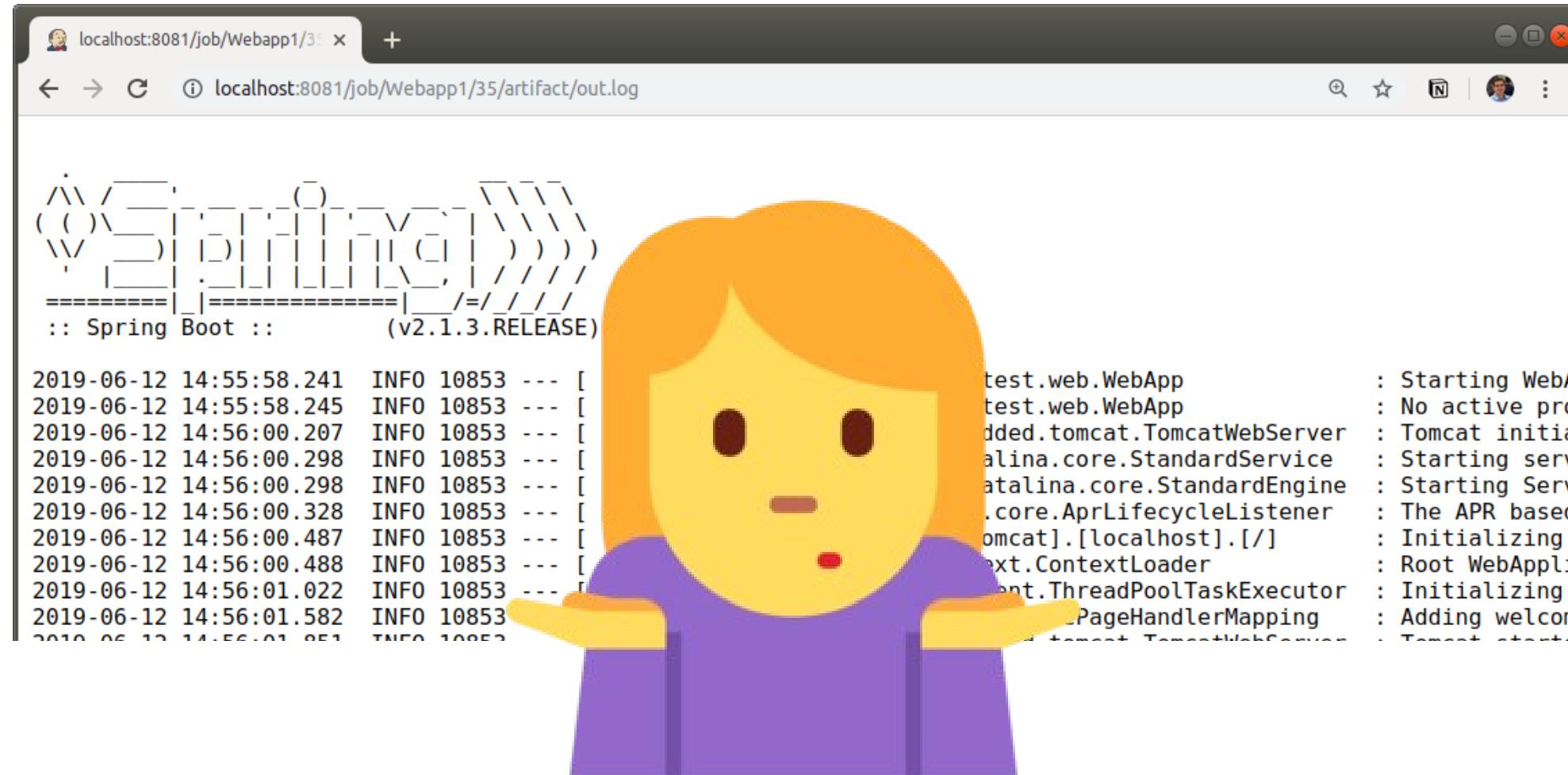
2019-06-12 14:55:58.241  INFO 10853 --- [           main] es.codeurjc.test.web.WebApp
2019-06-12 14:55:58.245  INFO 10853 --- [           main] es.codeurjc.test.web.WebApp
2019-06-12 14:56:00.207  INFO 10853 --- [           main] o.s.b.w.embedded.tomcat.TomcatWebServer
2019-06-12 14:56:00.298  INFO 10853 --- [           main] o.apache.catalina.core.StandardService
2019-06-12 14:56:00.298  INFO 10853 --- [           main] org.apache.catalina.core.StandardEngine
2019-06-12 14:56:00.328  INFO 10853 --- [           main] o.a.catalina.core.AprLifecycleListener
2019-06-12 14:56:00.487  INFO 10853 --- [           main] o.a.c.c.C.[Tomcat].[localhost].[/]
2019-06-12 14:56:00.488  INFO 10853 --- [           main] o.s.web.context.ContextLoader
2019-06-12 14:56:01.022  INFO 10853 --- [           main] o.s.s.concurrent.ThreadPoolTaskExecutor
2019-06-12 14:56:01.582  INFO 10853 --- [           main] o.s.b.a.w.s.WelcomePageHandlerMapping
2019-06-12 14:56:01.851  INFO 10853 --- [           main]
```

Which log entries are related to failed test?

SUT Logs are available as a text files



#expoQA19



# Logs management



- We need tools to **manage logs**
  - Put all logs in a single place
    - Test logs and SUT logs
    - Remote service to be used from SUT deployed in any place
  - Advanced **log analysis** capabilities
    - Filtering by test
    - Searching
    - Comparing executions (success vs fail)

# Logs management



#expoQA19



elastic



Elasticsearch



Kibana



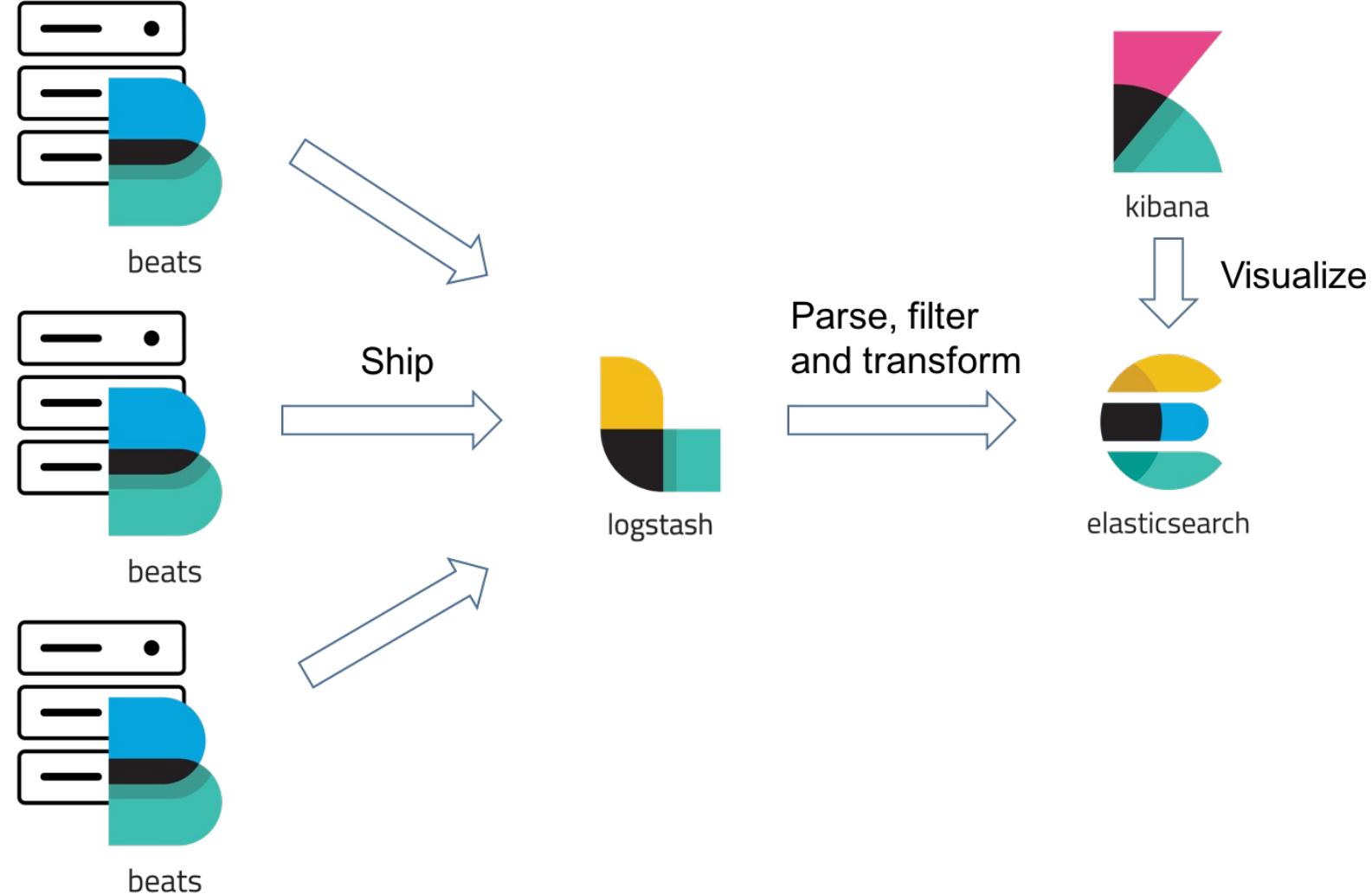
Logstash



Beats

<https://www.elastic.co/>

# Logs management



# Logs management



#expoQA19



# elasticsearch

- Open source search engine based on Lucene
- Full text search of JSON documents
- Http client
- Usually used to parse and analyze software logs

<https://www.elastic.co/products/elasticsearch>

# Logs management



# logstash

- Data processing pipeline
- Can ingest data from multiple sources
- Parse and transform input data
- Send results to ElasticSearch

<https://www.elastic.co/products/logstash>

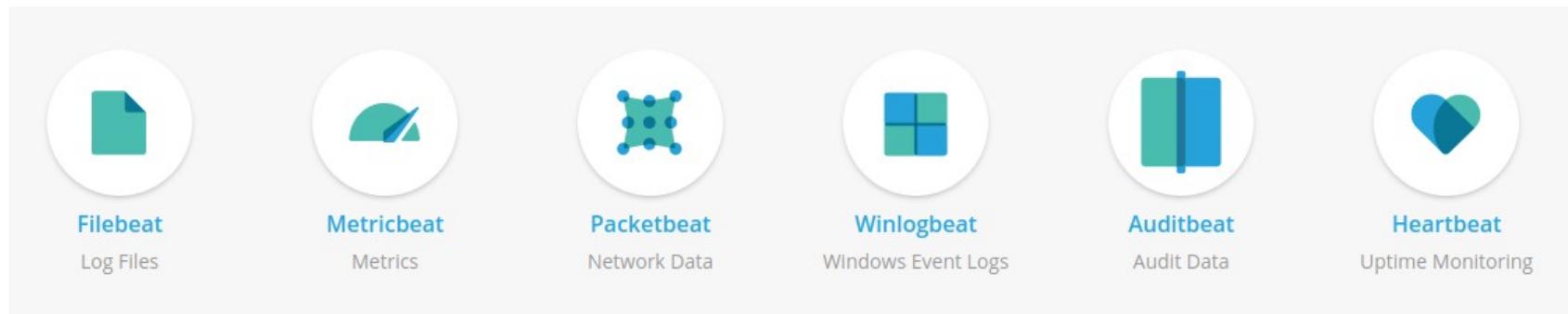
# Logs management



#expoQA19



- Lightweight data Shippers
- Send data to Logstash or ElasticSearch



<https://www.elastic.co/products/beats>

# Logs management

expoQA19  
MADRID 17<sup>th</sup> to 19<sup>th</sup> of JUNE 2019



# kibana

- Visualize ElasticSearch data
- Can define custom dashboards with graphics
- Filtering, search...
- Can access to raw data stored

<https://www.elastic.co/products/kibana>

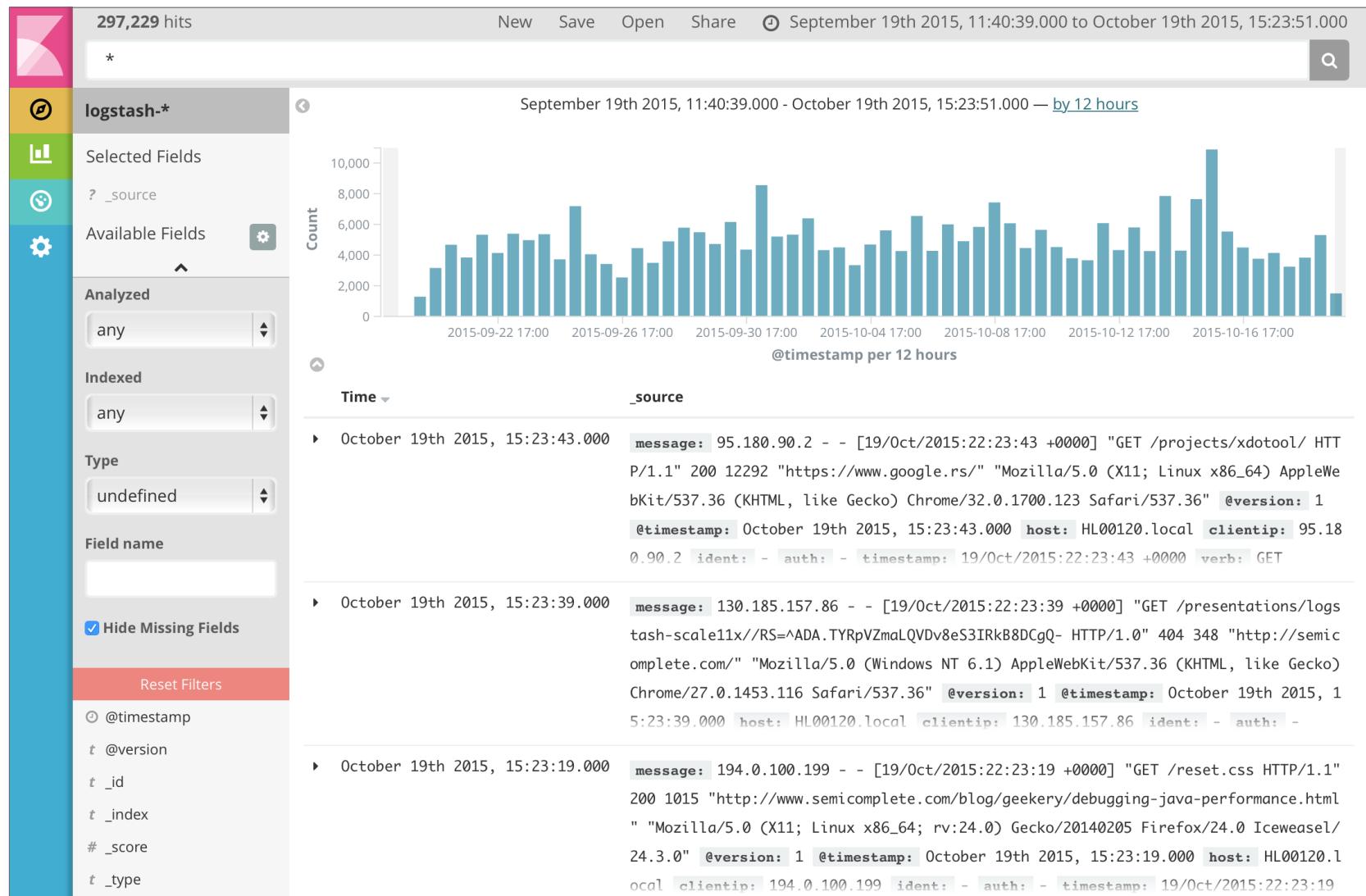


#expoQA19

# Logs management



#expoQA19



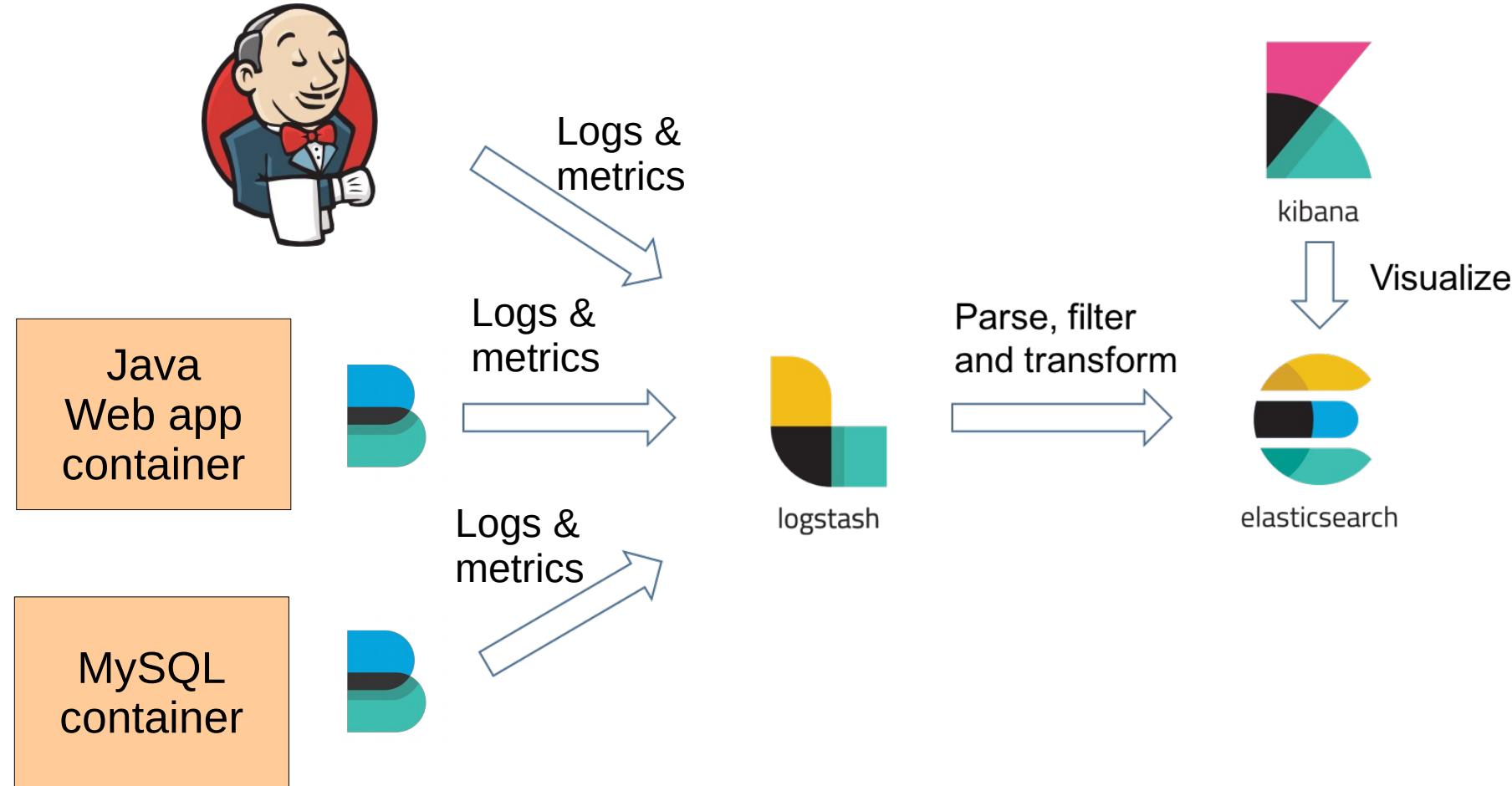
# Logs management



# Logs management



#expoQA19



# Logs management



#expoQA19

- Install and configure Elastic tools to receive logs from Jenkins
  - <http://www.admintome.com/blog/logging-jenkins-jobs-using-elasticsearch-and-kibana/>
  - <https://plugins.jenkins.io/logstash>
- Retrieve logs from SUT
  - Filebeat
  - Log directly to ElasticSearch
    - <https://github.com/magrossi/es-log4j2-appender>

# Demo 2

Manage logs with Elastic stack



<https://github.com/codeurjc/expoqa19/tree/demo2>

```
logstash {  
    node {  
        try {  
            stage("Preparation") {  
                git(  
                    url: 'https://github.com/codeurjc/expoqa19.git',  
                    branch: "demo2"  
                )  
            }  
            stage("Create jar") {  
                sh "docker-compose build"  
            }  
            stage("Start app") {  
                sh "docker-compose up -d"  
            }  
            stage("Test") {  
                sh "mvn test"  
            }  
        } finally {  
            sh "docker-compose down"  
            junit "target/*-reports/TEST-*xml"  
        }  
    }  
}
```

<https://github.com/codeurjc/expoqa19/blob/demo0/Jenkinsfile>



#expoQA19



# Logstash Plugin



#expoQA19

## Logstash

Enable sending logs to an Indexer ?

### Indexer Type

Elastic Search ▼ ?

URI  ?

User name  ?

Password  ?

Mime Type  ?

Advanced...

### Enable Globally



This will not enable it for pipeline jobs. ?

### Use millisecond time stamps



1

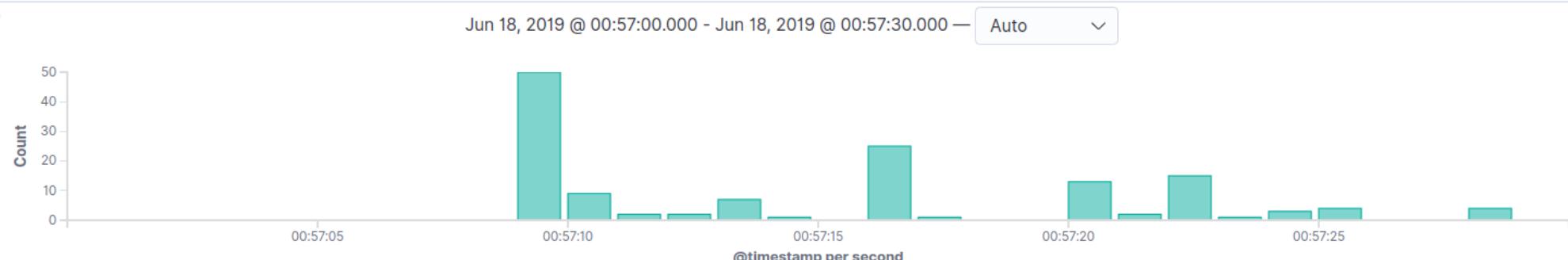
D | Discover

**139 hits**

New Save Open Share Inspect

[Filters](#) [Search](#)

 — + Add filter



| Time                          | json.log   |
|-------------------------------|--|
| > Jun 18, 2019 @ 00:57:28.102 | 2019-06-17 22:57:26.164 INFO 1 --- [nio-8080-exec-1] o.s.web.servlet.DispatcherServlet : Initializing Servlet 'dispatcherServlet'  |
| > Jun 18, 2019 @ 00:57:28.102 | 2019-06-17 22:57:26.173 INFO 1 --- [nio-8080-exec-1] o.s.web.servlet.DispatcherServlet : Completed initialization in 9 ms  |
| > Jun 18, 2019 @ 00:57:28.102 | 2019-06-17 22:57:26.311 INFO 1 --- [nio-8080-exec-1] o.h.h.i.QueryTranslatorFactoryInitiator : HHH000397: Using ASTQueryTranslatorFactory  |
| > Jun 18, 2019 @ 00:57:28.101 | 2019-06-17 22:57:26.164 INFO 1 --- [nio-8080-exec-1] o.a.c.c.C.[Tomcat].[localhost].[] : Initializing Spring DispatcherServlet 'dispatcherServlet'   |
| > Jun 18, 2019 @ 00:57:25.101 | 2019-06-17 22:57:24.138 WARN 1 --- [ main] aWebConfiguration\$JpaWebMvcConfiguration : spring.jpa.open-in-view is enabled by default. Therefore, database queries may be performed during view rendering. Explicitly configure spring.jpa.open-in-view to disable this warning |
| > Jun 18, 2019 @ 00:57:25.101 | 2019-06-17 22:57:24.284 INFO 1 --- [ main] o.s.b.a.w.s.WelcomePageHandlerMapping : Adding welcome page template: index   |
| > Jun 18, 2019 @ 00:57:25.101 | 2019-06-17 22:57:24.538 INFO 1 --- [ main] o.s.b.w.embedded.tomcat.TomcatWebServer : Tomcat started on port(s): 8080 (http) with context path ''   |
| > Jun 18, 2019 @ 00:57:25.101 | 2019-06-17 22:57:24.543 INFO 1 --- [ main] es.codeurjc.test.web.WebApp : Started WebApp in 6.752 seconds (JVM running for 7.367)   |
| > Jun 18, 2019 @ 00:57:24.100 | 2019-06-17 22:57:23.243 INFO 1 --- [ main] o.h.t.schema.internal.SchemaCreatorImpl : HHH000476: Executing import script 'org.hibernate.tool.schema.internal.exec.ScriptSourceInputNonExistentImpl@38af1bf6'  |





#expoQA19

## Index management

Update your Elasticsearch indices individually or in bulk.

X Include rollup indices

X Include system indices

| <input type="checkbox"/> | Name                             | Health   | Status | Primaries | Replicas | Docs count | Storage size |
|--------------------------|----------------------------------|----------|--------|-----------|----------|------------|--------------|
| <input type="checkbox"/> | test                             | ● yellow | open   | 1         | 1        | 17454      | 4.9mb        |
| <input type="checkbox"/> | filebeat-7.1.1-2019.06.17-000001 | ● yellow | open   | 1         | 1        | 902        | 431.2kb      |

Rows per page: 10 ▾



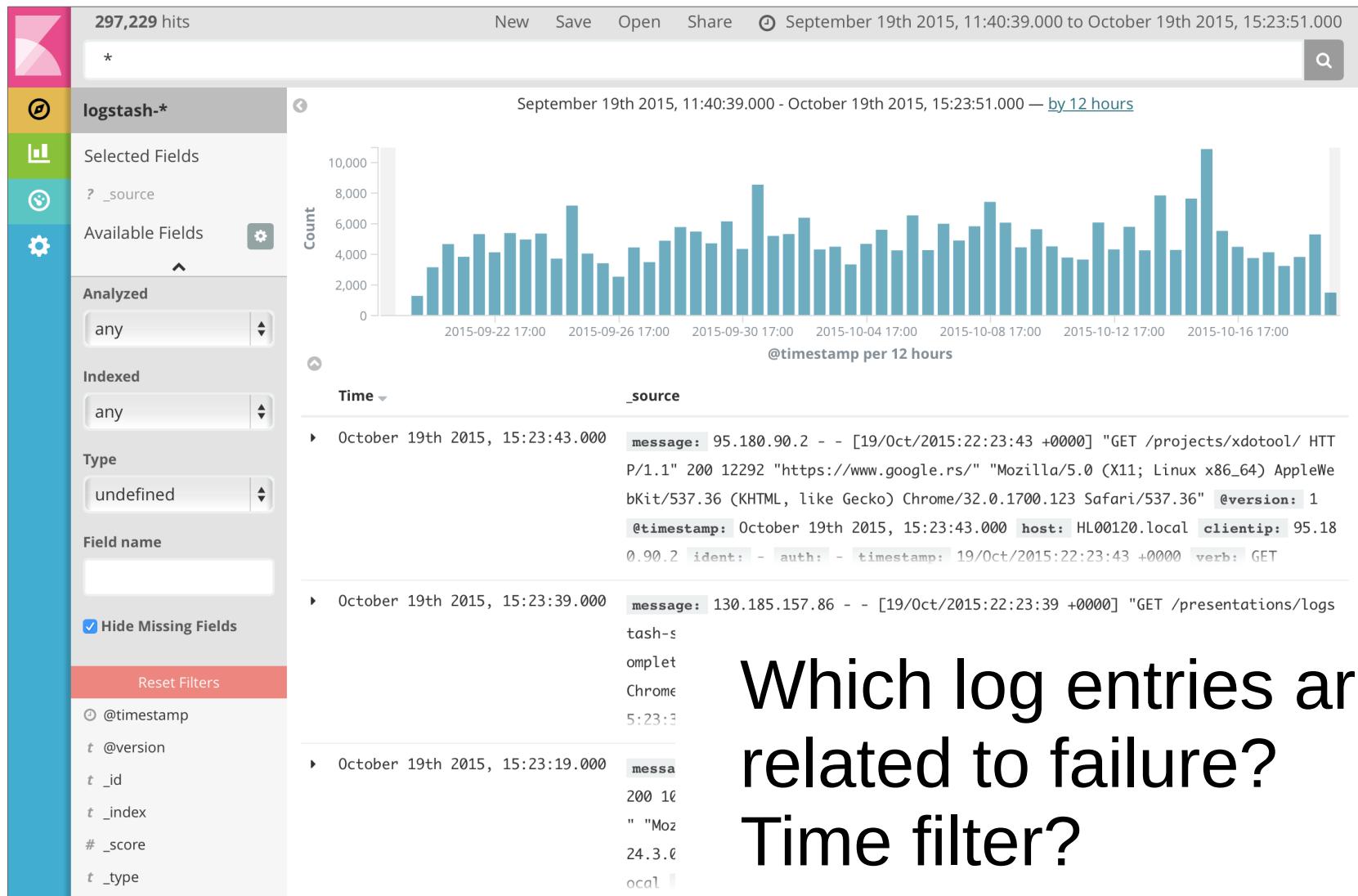
Are these observability tools  
designed for **testing**?

Is it easy to focus on information  
related to a **failed test**?

# Logs management



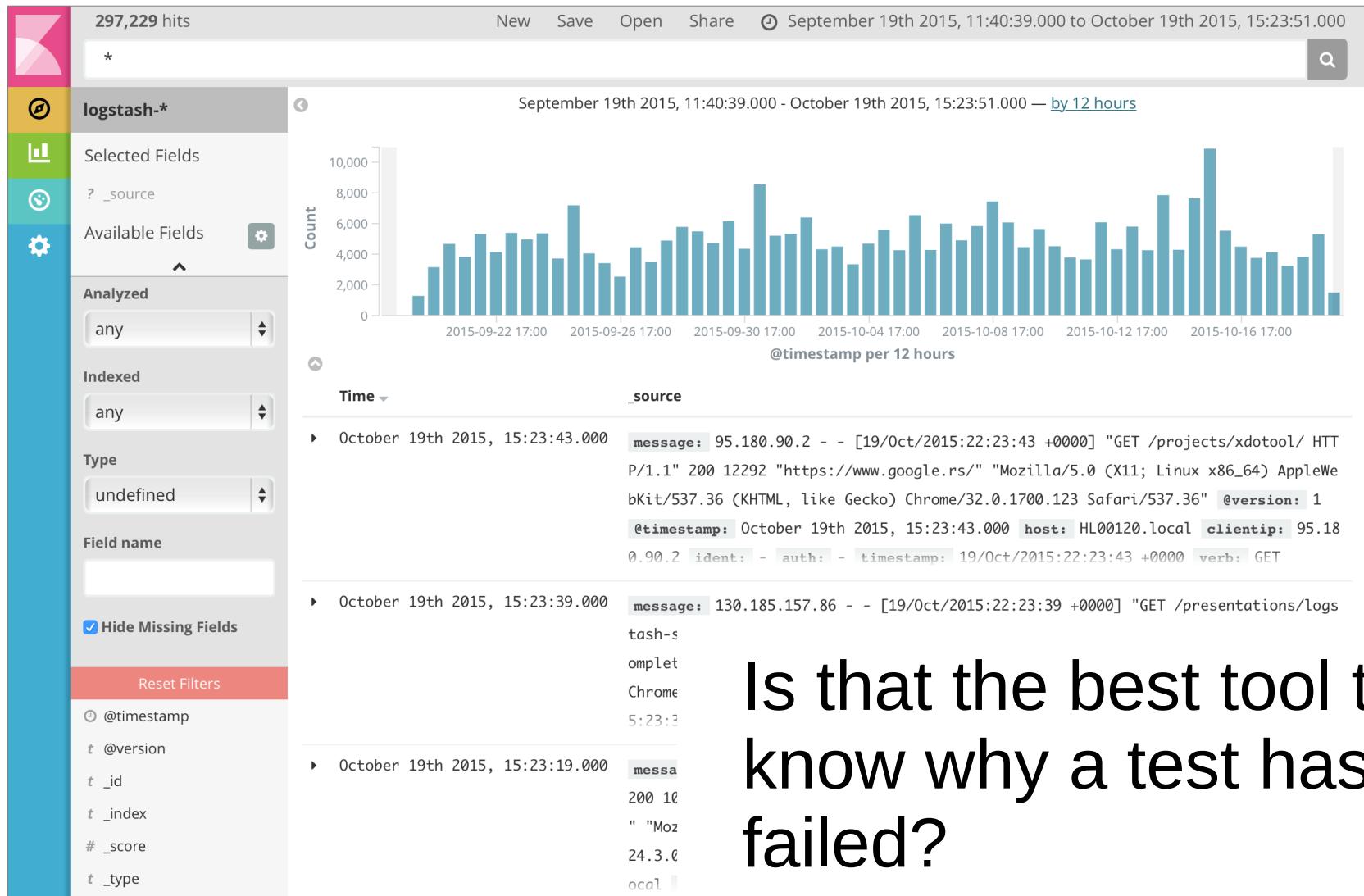
#expoQA19



Which log entries are related to failure?  
Time filter?



# Logs management



Is that the best tool to know why a test has failed?

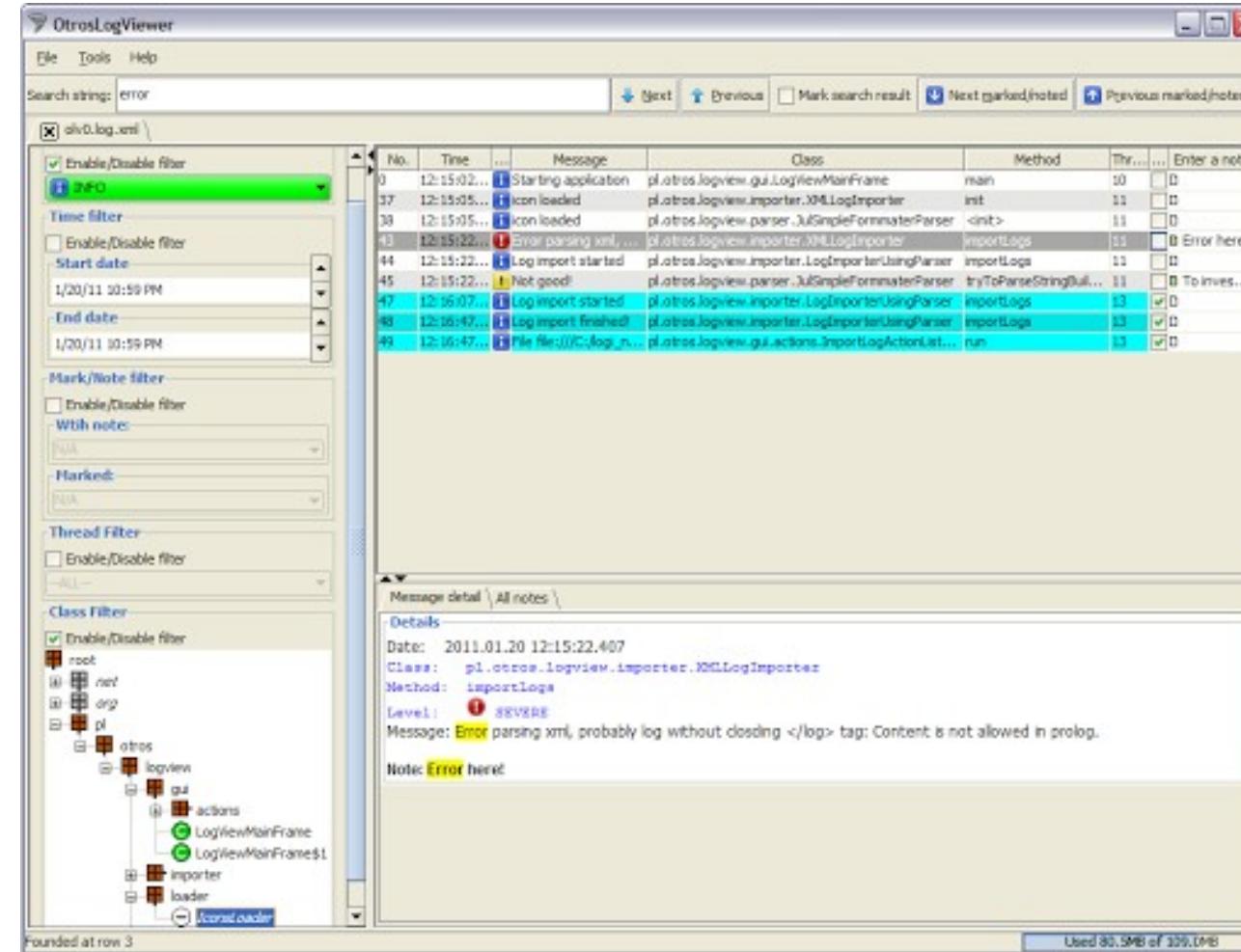


# Logs management



- Kibana is a generic tool to visualize and query JSON documents
- It is not designed specifically to log analysis
- Example:
  - You can filter results to only show ERROR log entries
  - But if you can take a look to previous log entries, you have to search again to show all entries

# Logs management



OtrosLogViewer is a powerful log analysis tool

# Logs management



- OtrosLogViewer
  - Is a tool that have to be installed locally
  - Logs have to be opened from local text files or connecting to servers using FTP
  - Can't process huge log files (it loads all file in memory)
  - It can not be used easily with CI systems

# Logs management



- What if a test wants to know if there are WARN messages in SUT logs ?

The screenshot shows a browser window titled 'report.html'. The address bar contains the URL 'file:///home/mica/Data/Kurento/KmsCluster/new\_cloned/kurento-cluster/kmscluster-controller/target/report.html'. The main content area displays a list of log entries. At the top left of this list, there is a button labeled 'Num WARNs or ERRORS: 13' with a 'Save' button next to it. The log entries are as follows:

```
[cluster] 2016-07-19 14:09:17,090 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e54149-t1] org.kurento.kms.controller.KmsProcessPipe
[cluster] 2016-07-19 14:09:17,185 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e54149-t0] org.kurento.kms.controller.KmsProcessPipe
[cluster] 2016-07-19 14:09:18,044 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e54153-t1] org.kurento.kms.controller.KmsProcessPipe
[cluster] 2016-07-19 14:09:18,158 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e54153-t0] org.kurento.kms.controller.KmsProcessPipe
[cluster] 2016-07-19 14:09:19,331 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e54157-t1] org.kurento.kms.controller.KmsProcessPipe
[cluster] 2016-07-19 14:09:19,454 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e54157-t0] org.kurento.kms.controller.KmsProcessPipe
[cluster] 2016-07-19 14:09:20,298 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e54162-t1] org.kurento.kms.controller.KmsProcessPipe
[cluster] 2016-07-19 14:09:20,467 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e54162-t0] org.kurento.kms.controller.KmsProcessPipe
[cluster] 2016-07-19 14:09:20,777 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e54165-t1] org.kurento.kms.controller.KmsProcessPipe
```

[LogManager](#)

Test ok

## MediaElementEventsTest [Tue Jul 19 16:14:15 CEST 2016]

givenAPlayerEndpoint\_whenAnEventListenerIsSubscribedInNonCreationSession\_thenEventIsReceivedInNonCreationSession - Execution 1/1

Num WARNs or ERRORS: 16 [Save](#)

```
[cluster] 2016-07-19 14:14:17,374 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e55068-t1] org.kurento.kms.controller.KmsProcessPipe
[cluster] 2016-07-19 14:14:17,477 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e55068-t0] org.kurento.kms.controller.KmsProcessPipe
[cluster] 2016-07-19 14:14:18,188 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e55071-t1] org.kurento.kms.controller.KmsProcessPipe
[cluster] 2016-07-19 14:14:18,309 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e55071-t0] org.kurento.kms.controller.KmsProcessPipe
[cluster] 2016-07-19 14:14:19,313 WARN [AbstractJsonRpcClientWebSocket-reqResEventExec-e55075-t1] org.kurento.kms.controller.KmsProcessPipe
```

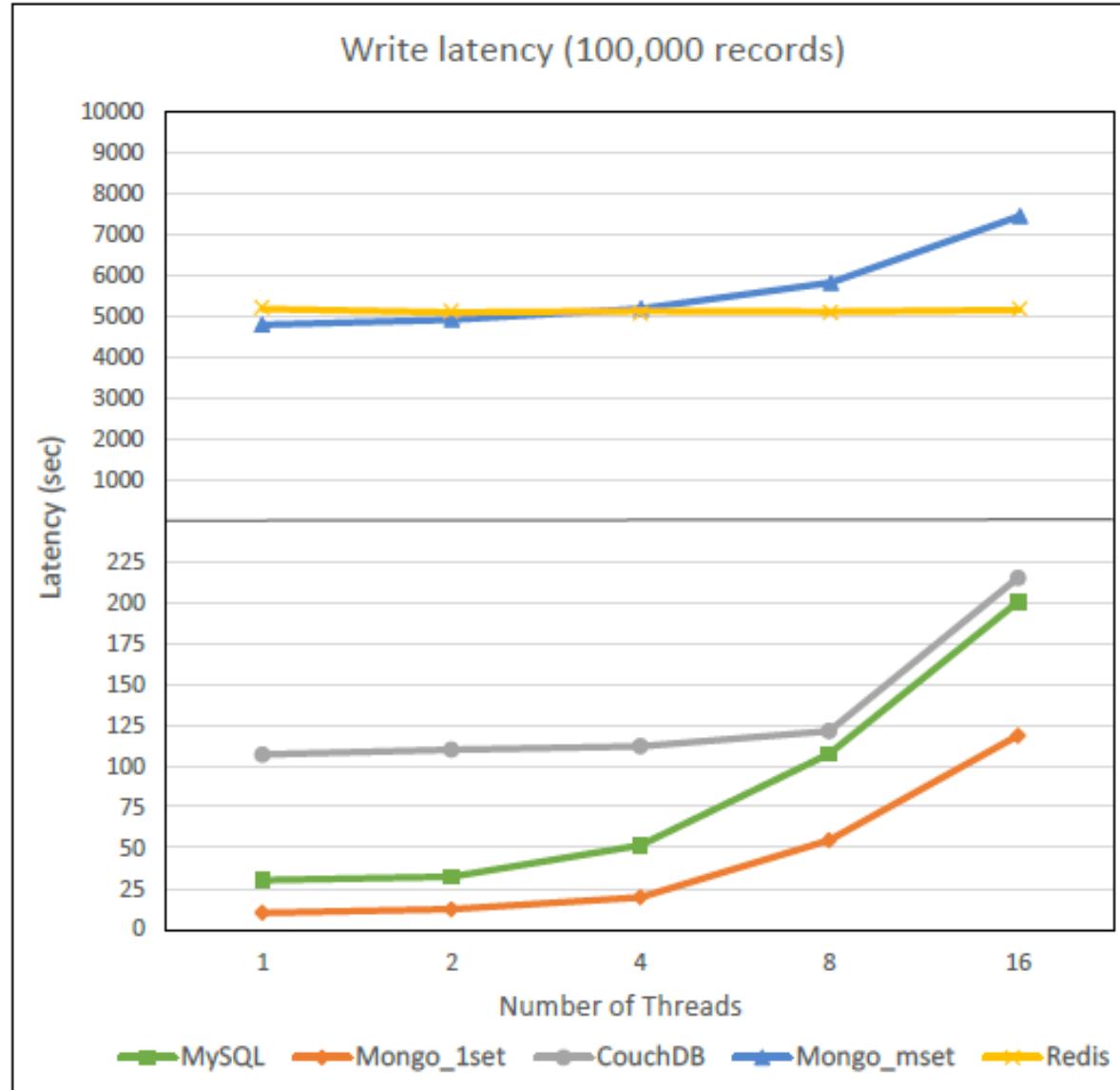
# Logs management



- It would be very useful to be able to compare the log of a failed test with previous sucess executions

```
8 2018-02-20 12:29:29.288 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Teacher getting into first session
9 2018-02-20 12:29:30.551 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Checking system message ("Connected") for Teacher
10 2018-02-20 12:29:30.683 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Starting browser (chrome)
11 2018-02-20 12:29:31.128 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Navigating to https://localhost:5000/
12 2018-02-20 12:29:34.078 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Logging in user Student with mail 'student1@gmail.com'
13 2018-02-20 12:29:38.075 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Logging in successful for user Student
14 2018-02-20 12:29:42.491 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Checking system message ("Student Imprudent has connected") for Teacher
15 2018-02-20 12:29:42.558 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Checking system message ("Teacher Cheater has connected") for Student
16 2018-02-20 12:29:45.343 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Checking own message ("TEACHER CHAT MESSAGE") for Teacher
17 2018-02-20 12:29:45.525 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Checking another user's message ("TEACHER CHAT MESSAGE") for Student
18 2018-02-20 12:29:46.972 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Checking another user's message ("STUDENT CHAT MESSAGE") for Teacher
19 2018-02-20 12:29:47.235 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Checking own message ("STUDENT CHAT MESSAGE") for Student
20 2018-02-20 12:29:49.436 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Logging out Student
21 2018-02-20 12:29:51.262 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Logging out successful for Student
22 2018-02-20 12:29:52.366 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Checking system message ("Student Imprudent has disconnected") for Teacher
23 2018-02-20 12:29:52.453 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Logging out Teacher
24 2018-02-20 12:34:28.295 [ main] INFO com.fullteaching.backend.e2e.FullTeachingTestE2EChat-c.f.backend.e2e.FullTeachingTestE2E
Logging out Teacher
```

# Metrics management



How difficult is  
compare metrics  
obtained with different  
technologies or  
parameters?



If SUT is a web application,  
the browser can help to know  
root cause of the problem  
when a system test fails



# Web Testing



- **Selenium** is the most used tool to manage browsers from tests
- Tests can take **screenshots** of the browser while executing and archive for later inspection



```
WebDriver driver = new FirefoxDriver();
driver.get("http://www.google.com/");
File scrFile = ((TakesScreenshot)driver).getScreenshotAs(OutputType.FILE);
// Now you can do whatever you need to do with it, for example copy somewhere
FileUtils.copyFile(scrFile, new File("c:\\tmp\\Screenshot.png"));
```

# Browser recording



#expoQA19

There are services to record a video of the browser when tests are executed



# Browser recording



#expoQA19



sauceondemand sample-project #82 Test Results > test > AppTest > test1

## Hudson

Back to Project Status Changes Console Output History Tag this build Test Result Previous Build Next Build

Logger Console Expand

Passed

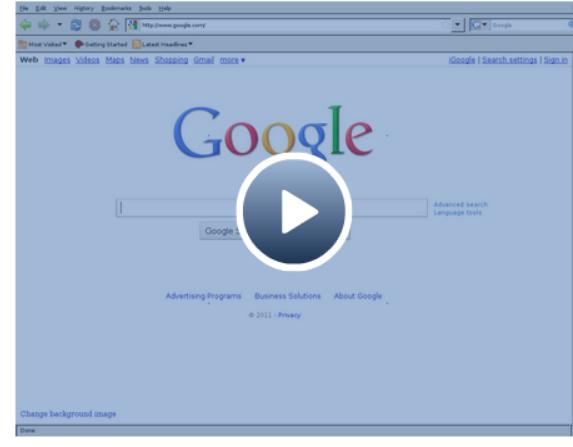
test.AppTest.test1 (from AppTest)

test.AppTest.test1

Job ID: c2af5df62c08bc051eba247591185e2f  
Platform: Linux firefox  
Created: Wed Feb 16 2011 21:56:54 GMT+0100 (Romance (standaardtijd))  
Started: Wed Feb 16 2011 21:56:55 GMT+0100 (Romance (standaardtijd))  
Ended: Wed Feb 16 2011 21:57:27 GMT+0100 (Romance (standaardtijd))  
Duration: 32 seconds  
Wait Time: 1 seconds  
Visibility: Private  
Build: 82  
Tags: None [add some]  
Custom Data: None [add some]  
Pass/Fail: Passed

Live Support! ^

Took 22 sec. Add description



# Browser recording



There are **open source** versions of these services based on docker



ZALENIUM



<https://zalando.github.io/zalenium/>

# Browser recording



#expoQA19

The screenshot shows the Zalenium Dashboard at [localhost:4444/dashboard/#](http://localhost:4444/dashboard/#). On the left, a sidebar lists two test runs: "searchingGitHub" (firefox 57.0.2, LINUX) and "searchingGitHub" (chrome 63.0.3239.108, LINUX), both marked as "Success". The main area displays a recorded session for "searchingGitHub" from 26-Dec 22:45:34. It includes details like Browser/Platform (firefox 57.0.2, LINUX), Screen Dimension (1280x720), Time Zone (Europe/Berlin), and Proxy (Zalenium). A large video player window shows a recording of a Firefox browser navigating to GitHub and performing a search. The recording interface has tabs for "Video" and "Logs". Below the video player, the text "Dashboard and video Recording" and "See videos, logs, test status and search. All in one place." is visible.

<https://zalando.github.io/zalenium/>



ZALENIUM

# Browser recording



#expoQA19

Also there are JUnit libraries with similiar features

JUnit 4



<https://www.testcontainers.org/>

JUnit 5

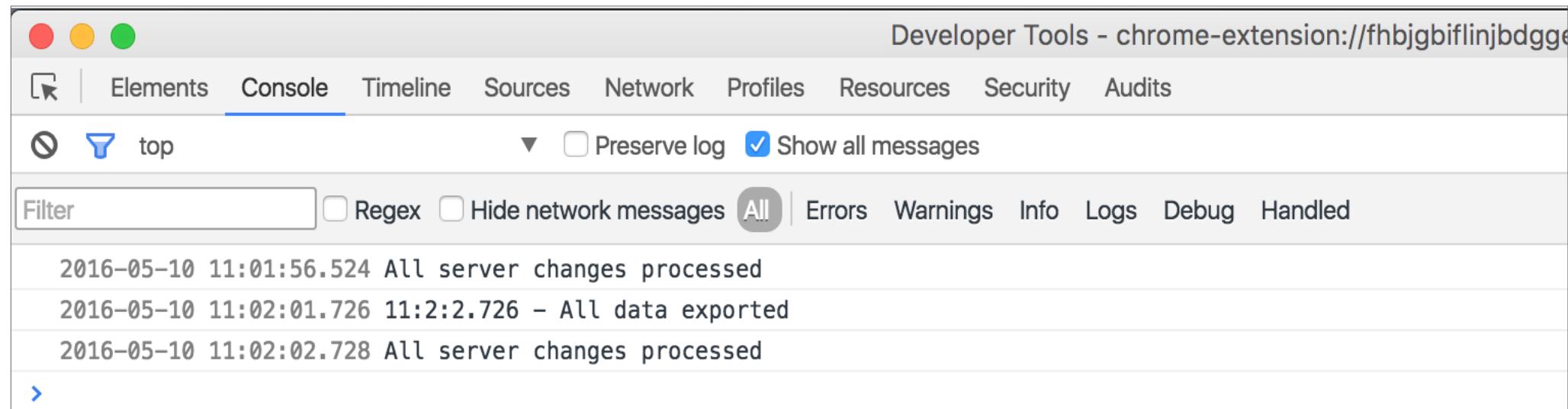


<https://bonigarcia.github.io/selenium-jupiter/>

# Limitations of browser recording



- Browser videos are not synchronized with logs
- Browser console is not registered with other logs (SUT logs, job logs...)



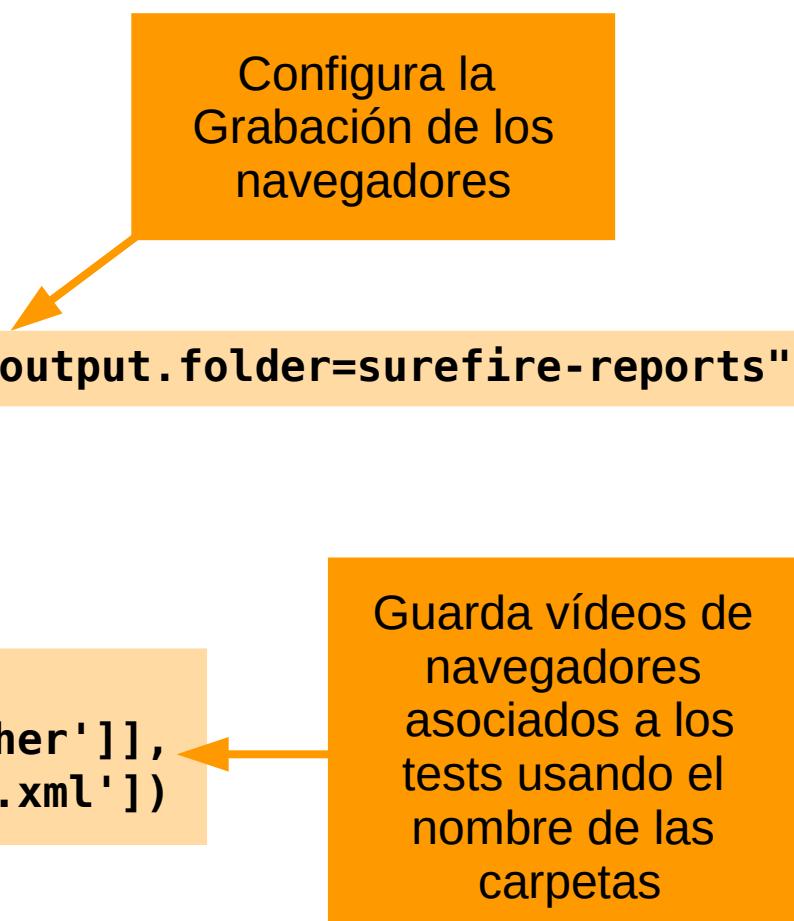
# Demo 3

Dockerized browsers with  
video recorded



<https://github.com/codeurjc/expoqa19/tree/demo3>

```
logstash {  
    node {  
        try {  
  
            stage("Preparation") { ... }  
            stage("Create jar") { ... }  
            stage("Start app") { ... }  
            stage("Test") {  
                sh "mvn test -Dsel.jup.recording=true -Dsel.jup.output.folder=surefire-reports"  
            }  
  
        } finally {  
            sh "docker-compose down"  
  
            step([$class: 'JUnitResultArchiver',  
                  testDataPublishers: [[${class: 'AttachmentPublisher'}]],  
                  testResults: '**/target/surefire-reports/TEST-*.*xml'])  
        }  
    }  
}
```



```
@Test
public void createMessageTest(
    @DockerBrowser(type = CHROME) RemoteWebDriver localDriver,
    TestInfo info) throws InterruptedException, MalformedURLException {
    this.driver = localDriver;

    driver.get(sutURL);
    LOG.info("Web loaded");
    Thread.sleep(3000);

    String newTitle = "MessageTitle";
    String newBody = "MessageBody";

    addMessage(newTitle, newBody);

    String title = driver.findElement(By.id("title")).getText();
    String body = driver.findElement(By.id("body")).getText();

    assertEquals(newTitle, title);
    assertEquals(newBody, body);
    LOG.info("Message verified");

    Thread.sleep(2000);
}
```

Uso de browser Dockerizado con Selenium Jupiter



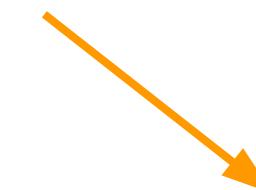
Jenkins > demo3 > #10 > Test Results > es.codeurjc.test.web > WebAppTest

#expoQA19

-  History
-  Parameters
-  Git Build Data
-  No Tags
-  Test Result
-  Replay
-  Pipeline Steps
-  Workspaces
-  Attachments
-  Previous Build

## Test Result : WebAppTest

1 failures (-1)



### Attachments

#### Files

[createMessageTest\\_arg0\\_CHROME\\_75.0\\_0ceba39a6c053dc066661c52b680c62e.mp4](#)  
[createMessageTest\\_arg0\\_CHROME\\_75.0\\_4e9cef46e88abf417a21bef2d873a557.mp4](#)  
[createMessageTest\\_arg0\\_CHROME\\_75.0\\_d8c73852e78322231c7f6fc547ebf38c.mp4](#)  
[removeMessageTest\\_arg0\\_CHROME\\_75.0\\_2988266d6a1050a1d0b006527ee48dd2.mp4](#)  
[removeMessageTest\\_arg0\\_CHROME\\_75.0\\_328a8f4a5a89046ae5d87149024c32fd.mp4](#)  
[removeMessageTest\\_arg0\\_CHROME\\_75.0\\_b2cff9d1c009252cf0383a101f9f394.mp4](#)

## All Tests

### Test name

[createMessageTest\(RemoteWebDriver, TestInfo\)](#)  
[removeMessageTest\(RemoteWebDriver, TestInfo\)](#)



**It is possible to improve  
observability of end to end  
testing of cloud native  
applications?**



**ElasTest**

# What is ElasTest?



#expoQA19

- Open source platform for **E2E testing of cloud native applications**
  - Distributed and complex
  - Containerized



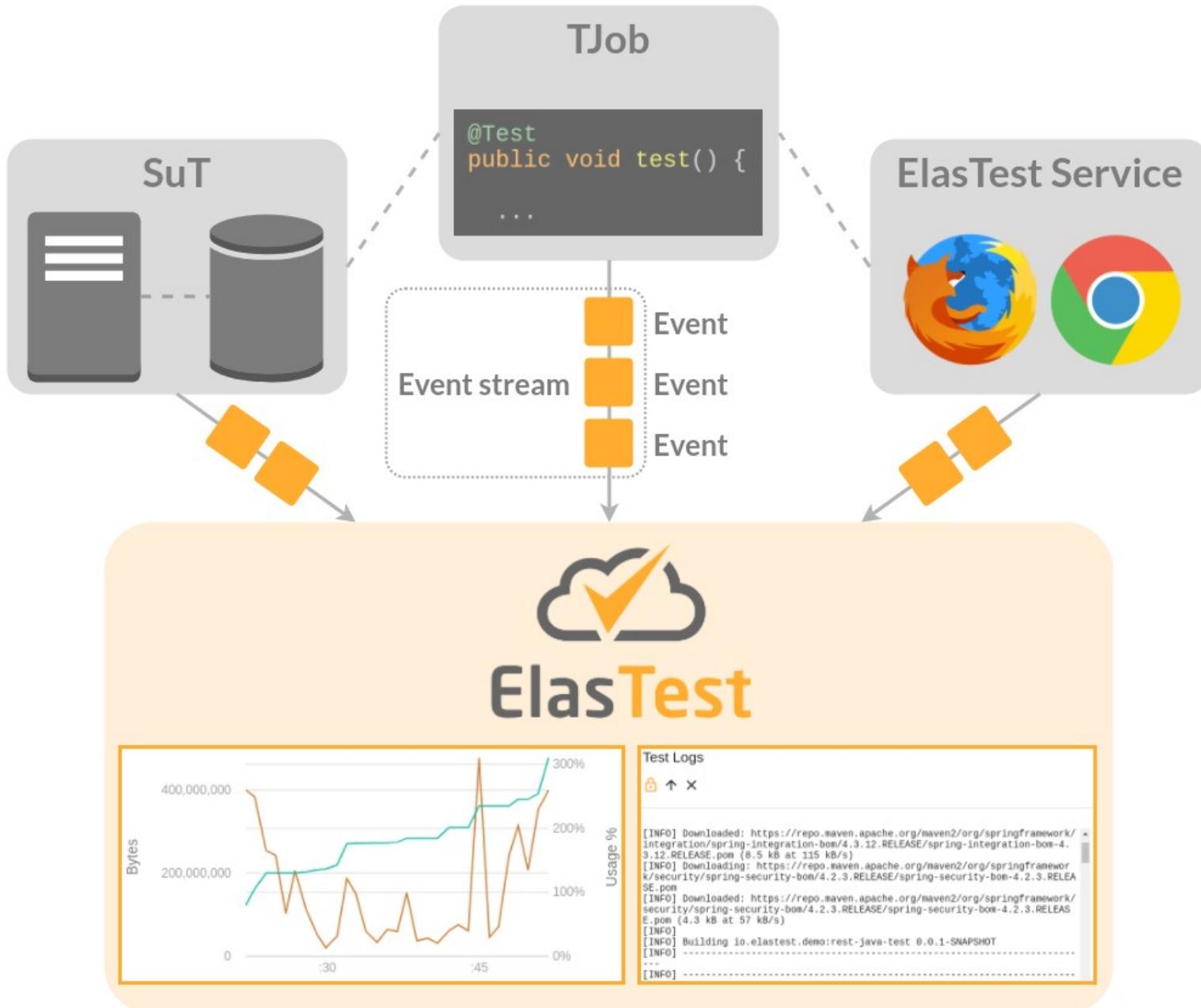
<https://elastest.io>

# What is ElasTest?



#expoQA19

- Main features
  - Log and metrics visualization, recording and management
  - Log/Metrics analysis and comparison
  - Web browsers management
  - Jenkins and TestLink integration



# Features



- **Works with your current tests & Jenkins jobs**
  - With any **programming language**
  - With any **testing framework**
  - With your usual tools like **selenium**



# Minimal code changes



- Log test **start** and **end**

```
public class BaseTest {  
  
    protected static final Logger logger = LoggerFactory.getLogger(ElasTestBase.class);  
  
    @Rule  
    public TestName name = new TestName();  
  
    @Before  
    public void logStart() {  
        logger.info("##### Start test: " + name.getMethodName());  
    }  
  
    @After  
    public void logEnd() {  
        logger.info("##### Finish test: " + name.getMethodName());  
    }  
}
```

# Minimal code changes



- Create Selenium browsers with the **remote URL** specified in an environment variable provided by ElasTest

```
public class BaseTest {  
  
    @Before  
    public void setupTest() throws MalformedURLException {  
  
        String eusURL = System.getenv("ET_EUS_API");  
        if (eusURL == null) {  
  
            // Local Google Chrome  
            driver = new ChromeDriver();  
        } else {  
  
            // Selenium Grid in ElasTest  
            driver = new RemoteWebDriver(new URL(eusURL), chrome());  
        }  
    }  
}
```

# Demo 4

Testing with ElasTest



<https://github.com/codeurjc/expoqa19/tree/demo4>

```
node {
```

```
    elastest(  
        tss: ['EUS'], monitoring: true, project: 'ExpoQA19'  
        surefireReportsPattern: '**/target/surefire-reports/TEST-*.*xml', ) {
```

```
        try {  
            stage("Preparation") {  
                git(  
                    url: 'https://github.com/codeurjc/expoqa19.git',  
                    branch: "demo4"  
                )  
            }  
        }
```

```
        stage("Create jar") {  
            sh "docker-compose build"  
        }  
        stage("Start app") {  
            sh "docker-compose -p ${env.ET_SUT_CONTAINER_NAME} up -d"  
        }  
        stage("Test") {  
            sh "mvn test"  
        }
```

```
} finally {  
  
    sh "docker-compose -p ${env.ET_SUT_CONTAINER_NAME} down"  
  
    junit "target/*-reports/TEST-*.*xml"  
}
```

ElasTest configuration

Start app

SUT Identification

# Log management



## Job logs are managed in ElasTest



```
My_Pipeline_2 #20 Cons... TJob Execution
localhost:8095/jenkins/job/My_Pipeline_2/20/console

Jenkins > My_Pipeline_2 > #20

: Using URL https://localhost:5000/ to connect to openvidu-testapp
Starting ChromeDriver 2.33.506120 (e3e53437346286c0bc2d2dc9aa4915ba81d9023f) on port 5295
Only local connections are allowed.
nov 22, 2017 11:13:31 AM org.openqa.selenium.remote.ProtocolHandshake createSession
INFORMACIÓN: Detected dialect: OSS
2017-11-22 11:13:33.383 INFO --- [           main] c.f.backend.e2e.FullTeachingTest
: Test video session
Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 36.212 sec - in
com.fullteaching.backend.e2e.FullTeachingTest

Results :

Tests run: 1, Failures: 0, Errors: 0, Skipped: 0

[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 01:13 min
[INFO] Finished at: 2017-11-22T11:13:58+01:00
[INFO] Final Memory: 21M/246M
[INFO] -----
[Pipeline] bat
[My_Pipeline_2] Running batch script

D:\git\elastest-jenkins\work\workspace\My_Pipeline_2>set ET_EUS_API
Variable de entorno ET_EUS_API no definida
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // node
[Pipeline] }
[Pipeline] // elastest
[Pipeline] End of Pipeline
ERROR: script returned exit code 1
```



```
My_Pipeline_2 #20 Cons... TJob Execution
localhost:4200/#/projects/9/tjob/11/tjob-exec/223

ElasTest My_Pipeline_2 / My_Pipeline_2 / Execution 223

Dashboard Projects Web Browsers Log Analyzer

Test Logs

elelenium Driver
2017-11-22 11:13:27.572 INFO --- [ main] c.f.backend.e2e.FullTeachingTest : Using URL ht
ps://localhost:5000/ to connect to openvidu-testapp
Starting ChromeDriver 2.33.506120 (e3e53437346286c0bc2d2dc9aa4915ba81d9023f) on port 5295
Only local connections are allowed.
nov 22, 2017 11:13:31 AM org.openqa.selenium.remote.ProtocolHandshake createSession
INFORMACIÓN: Detected dialect: OSS
2017-11-22 11:13:33.383 INFO --- [ main] c.f.backend.e2e.FullTeachingTest : Test video se
ssion
Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 36.212 sec - in com.fullt
eaching.backend.e2e.FullTeachingTest
Results :
Tests run: 1, Failures: 0, Errors: 0, Skipped: 0
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 01:13 min
[INFO] Finished at: 2017-11-22T11:13:58+01:00
[INFO] Final Memory: 21M/246M
[INFO] -----
[My_Pipeline_2] Running batch script
Variable de entorno ET_EUS_API no definida
```

# Logs for different SUT components...

The screenshot shows a web interface for log analysis, likely from a tool like ElasTest. It displays three main sections:

- ElasTest Log Analyzer:** Shows logs for a "FullTeaching Exp / GOLD / Execution 46". The logs include test results for a "FullTeachingTestE2E" and a "LogAnalyzer" section with build success messages.
- Sut\_full\_teaching\_mysql Logs:** Displays MySQL shutdown logs. Key entries include:

```
PAGE_LRU'
2018-04-04T13:30:25.779730Z 0 [Note] Shutting down plugin 'INNODB_BUFFER_PAGE'
2018-04-04T13:30:25.779734Z 0 [Note] Shutting down plugin 'INNODB_CMP_PER_INDEX_RESET'
2018-04-04T13:30:25.779738Z 0 [Note] Shutting down plugin 'INNODB_CMP_PER_INDEX'
2018-04-04T13:30:25.779742Z 0 [Note] Shutting down plugin 'INNODB_CMPMEM_RESET'
2018-04-04T13:30:25.779746Z 0 [Note] Shutting down plugin 'INNODB_CMPMEM'
2018-04-04T13:30:25.779770Z 0 [Note] Shutting down plugin 'InnoDB'
2018-04-04T13:30:25.779824Z 0 [Note] InnoDB: FTS optimize thread exiting.
2018-04-04T13:30:25.779969Z 0 [Note] InnoDB: Starting shutdown...
2018-04-04T13:30:25.880232Z 0 [Note] InnoDB: Dumping buffer pool(s) to /var/lib/mysql/ib_buffer_pool
2018-04-04T13:30:25.880512Z 0 [Note] InnoDB: Buffer pool(s) dump complete at 180404 13:30:25
2018-04-04T13:30:27.290280Z 0 [Note] InnoDB: Shutdown completed; log sequence number 12808561
2018-04-04T13:30:27.291962Z 0 [Note] InnoDB: Removed temporary tablespace
```
- Sut\_full\_teaching\_openvidu\_server\_kms Logs:** Displays logs for the OpenVidu Server KMS component. Key entries include:

```
2018-04-04 13:30:26,184 DEBG 'kms' stdout output:
0:06:40.690791463 0[334m 9][0m 0xdbd8cc0 0[36mINFO 0[0m 0[0m KurentoMediaSet MediaSet.cpp:110:deleteMediaSet:0[0m Destroying mediaSet
0:06:40.690811771 0[334m 9][0m 0 0xdbd8cc0 0[37mDEBUG 0[0m 0[0m KurentoMediaSet MediaSet.cpp:169:~MediaSet:0[0m Still 1 object/s alive
2018-04-04 13:30:26,184 DEBG 'kms' stdout output:
0:06:40.690854941 0[334m 9][0m 0xf94900 0[37mDEBUG 0[0m 0[0m KurentoWorkerPool WorkerPool.cpp:49:workerThreadLoop:0[0m Working thread finished
0:06:40.690864205 0[334m 9][0m 0x7f03340018a0 0[37mDEBUG 0[0m 0[0m KurentoWorkerPool WorkerPool.cpp:49:workerThreadLoop:0[0m Working thread finished
2018-04-04 13:30:26,184 DEBG 'kms' stdout output:
0:06:40.691085812 0[334m 9][0m 0xdbd8cc0 0[37mDEBUG 0[0m 0[0m KurentoMediaSet MediaSet.cpp:469:async_delete:0[0m Destroying ServerManager -> manager_ServerManager
2018-04-04 13:30:26,184 DEBG 'kms' stdout output:
0:06:40.691120933 0[334m 9][0m 0xdbd8cc0 0[36mINFO 0[0m 0[0m KurentoMediaServer main.cpp:263:main:0[0m Mediaserver stopped
```



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# Log Analyzer

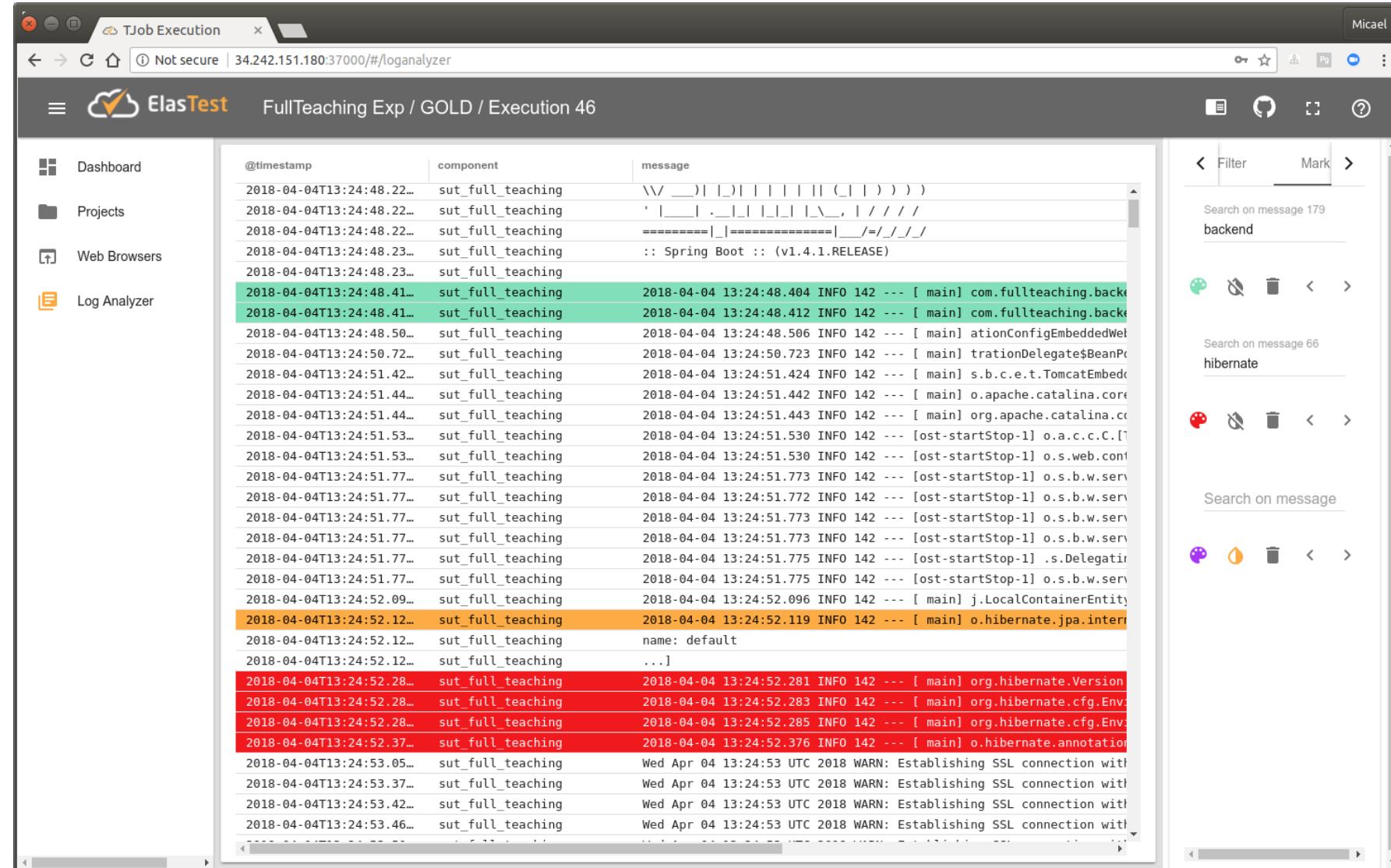


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The screenshot shows the ElasTest Log Analyzer interface. On the left, a sidebar menu includes Dashboard, Projects, Web Browsers, and Log Analyzer. The Log Analyzer section is active, displaying a table of log entries. The table has columns for @timestamp, component, and message. The messages show logs from various components like test, FullTeaching, and different browser instances (tss\_eus\_browser\_f330e219...) over time. On the right, a sidebar provides filtering options: a 'Filter' button, a dropdown for 'Executions' (set to 46), a 'Select Executions' button, date range sliders ('From Date' at 04/04/2018, 01:23:12 PM and 'To Date' at 04/04/2018, 01:30:15 PM), a 'Components/Streams' section with checkboxes for sut\_full\_teaching\_open, test, sut\_full\_teaching\_mysc, sut\_full\_teaching, tss\_eus\_browser\_21a3, tss\_eus\_browser\_c5a8f, and tss\_eus\_browser\_1e8a, and a 'Message' section with a search input and a 'Re' button.

All logs in the same place (Job, Tests, browser console, SUT components)

# Log Analyzer



Search,  
filter, mark,  
per test,  
per SUT  
component

# Log and metrics integration



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The screenshot shows the ElasTest web interface. On the left, there's a sidebar with icons for Projects, TJob Execs, Test Engines, Test Support Services, and Log Analyzer. The main area has a title "Full Teaching 2 / Teacher and Student / Execution 85". A "Chart configuration" section displays a line graph of CPU usage over time, with a sharp peak around 04:30. Below the chart is a "Test Logs" section showing Maven download logs:

```
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/shared-components/18/maven-shared-components-18.pom
[INFO] Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/shared-components/18/maven-shared-components-18.pom
[INFO] [4.9 kB at 176 kB/s]
[INFO] Downloading: https://repo.maven.apache.org/maven2/com/google/code/findbugs/jxr305/2.0.1/jxr305-2.0.1.pom
[INFO] Downloaded: https://repo.maven.apache.org/maven2/com/google/code/findbugs/jxr305/2.0.1/jxr305-2.0.1.pom (965 B at 25 kB/s)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-shared-incremental/1.1/maven-shared-incremental-1.1.pom
[INFO] Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-shared-incremental/1.1/maven-shared-incremental-1.1.pom (4.7 kB at 139 kB/s)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-shared-components/19/maven-shared-components-19.pom
[INFO] Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-shared-components/19/maven-shared-components-19.pom
[INFO] [6.4 kB at 289 kB/s]
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/maven-plugin-api/2.2.1/maven-plugin-api-2.2.1.pom
[INFO] Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/maven-plugin-api/2.2.1/maven-plugin-api-2.2.1.pom (1.5 kB at 43 kB/s)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/maven/2.2.1/maven-2.2.1.pom
[INFO] Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/maven/2.2.1/maven-2.2.1.pom (22 kB at 700 kB/s)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/11/maven-parent-11.pom
[INFO] Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/11/maven-parent-11.pom (32 kB at 1.2 MB/s)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/apache/5/apache-5.pom
[INFO] Downloaded: https://repo.maven.apache.org/maven2/org/apache/apache/5/apache-5.pom (4.1 kB at 146 kB/s)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/maven-core/2.2.1/maven-core-2.2.1.pom
[INFO] Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/maven-core/2.2.1/maven-core-2.2.1.pom (12 kB at 364 kB/s)
```

# Web browsers



The screenshot shows the ElasTest web interface with a browser automation test execution. The main window displays a login screen for 'FullTeaching' with the URL <https://172.18.0.18:5000>. The browser title bar says 'Chrome 61 - automated test'. The page content includes a 'Welcome to FullTeaching!' message, an email input field ('student1@gmail.com'), a password input field ('...'), and 'LOG IN' and 'CLOSE' buttons. Below the browser window, there is a large image of a laptop keyboard with the text 'Do not limit yourself' and 'Learning should have no limits'. The background of the main interface shows a sidebar with navigation links like 'Projects', 'TJob Execs', 'Test Engines', 'Test Support Services', and 'Log Analyzer'. On the right side, there is a 'Logs' panel displaying log entries such as '[io-5000-exec-10] c.f.backen' and '[io-5000-exec-10] c.f.backen'. At the bottom, there are 'Actions' buttons labeled 'View'.



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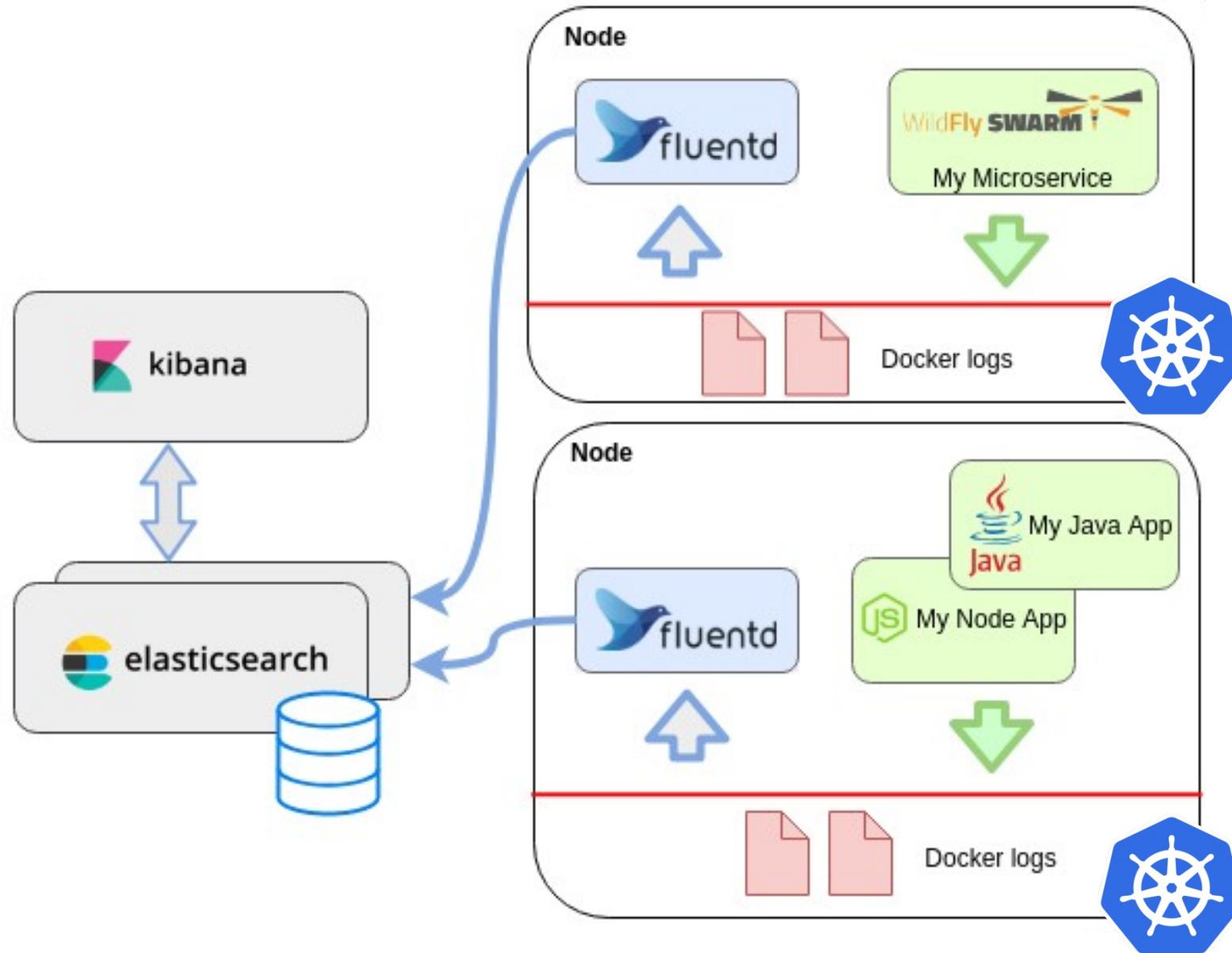


# kubernetes



#expoQA19

# Logs



# Logs

**kibana**

17 hits

Search... (e.g. status:200 AND extension:PHP)

New Save Open Share Reporting  Auto-refresh ⏪ ⏴ Last 15 minutes Options ⌂

Discover **kubernetes.namespace\_name: "logging" kubernetes.container\_name: "nginx" Add a filter +** Actions ▾

Visualize **logstash\***

Selected Fields

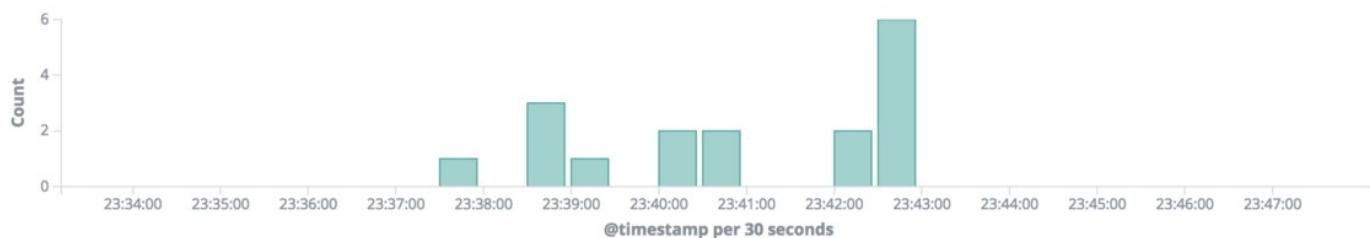
- t\_kubernetes.pod\_...
- t\_log

Available Fields

- ⌚ @timestamp
- t\_id
- t\_index
- #\_score
- t\_type
- t\_kubernetes.container...
- t\_kubernetes.docker\_id
- t\_kubernetes.host
- t\_kubernetes.labels.po...
- t\_kubernetes.labels.run
- t\_kubernetes.namespa...
- t\_kubernetes.pod\_id
- t\_stream
- ⌚ time

September 21st 2018, 23:33:10.904 - September 21st 2018, 23:48:10.904 — Auto

Count



@timestamp per 30 seconds

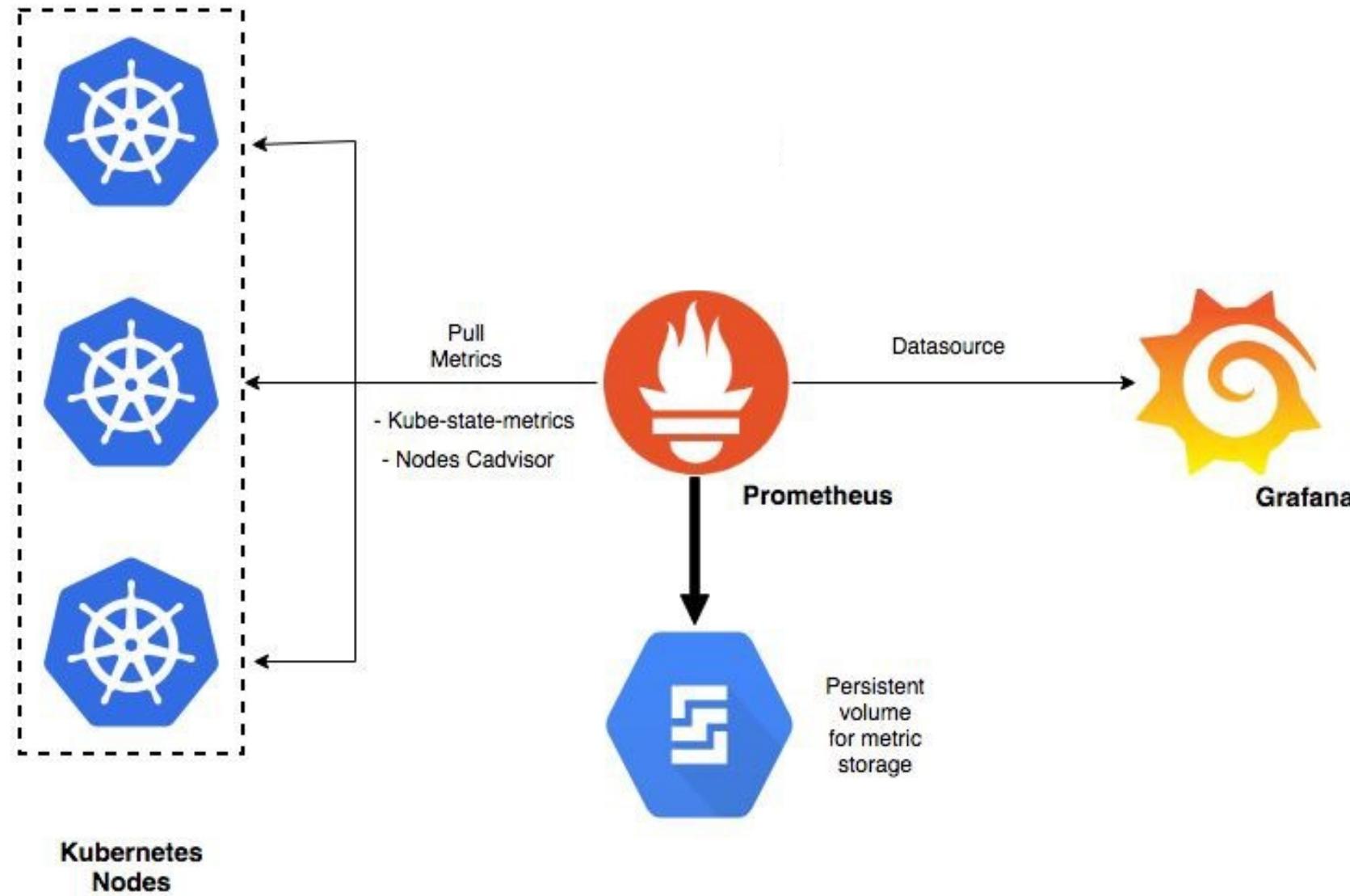
| Time                              | log   | kubernetes.pod_name |
|-----------------------------------|---|---------------------|
| September 21st 2018, 23:42:48.808 | 127.0.0.1 - - [21/Sep/2018:22:42:48 +0000] "GET / HTTP/1.1" 200 612 "-" "curl/7.54.0" "-" | nginx-8586cf59-kpb6 |
| September 21st 2018, 23:42:44.078 | 127.0.0.1 - - [21/Sep/2018:22:42:44 +0000] "GET / HTTP/1.1" 200 612 "-" "curl/7.54.0" "-" | nginx-8586cf59-kpb6 |
| September 21st 2018, 23:42:40.220 | 127.0.0.1 - - [21/Sep/2018:22:42:40 +0000] "GET / HTTP/1.1" 200 612 "-" "curl/7.54.0" "-" | nginx-8586cf59-kpb6 |
| September 21st 2018, 23:42:36.687 | 127.0.0.1 - - [21/Sep/2018:22:42:36 +0000] "GET / HTTP/1.1" 200 612 "-" "curl/7.54.0" "-" | nginx-8586cf59-kpb6 |
| September 21st 2018, 23:42:33.972 | 127.0.0.1 - - [21/Sep/2018:22:42:33 +0000] "GET / HTTP/1.1" 200 612 "-" "curl/7.54.0" "-" | nginx-8586cf59-kpb6 |
| September 21st 2018, 23:42:31.322 | 127.0.0.1 - - [21/Sep/2018:22:42:31 +0000] "GET / HTTP/1.1" 200 612 "-" "curl/7.54.0" "-" | nginx-8586cf59-kpb6 |
| September 21st 2018, 23:42:27.922 | 127.0.0.1 - - [21/Sep/2018:22:42:27 +0000] "GET / HTTP/1.1" 200 612 "-" "curl/7.54.0" "-" | nginx-8586cf59-kpb6 |
| September 21st 2018, 23:42:23.927 | 127.0.0.1 - - [21/Sep/2018:22:42:23 +0000] "GET / HTTP/1.1" 200 612 "-" "curl/7.54.0" "-" | nginx-8586cf59-kpb6 |

#expoQA19



#expoQA19

# Metrics



# Metrics

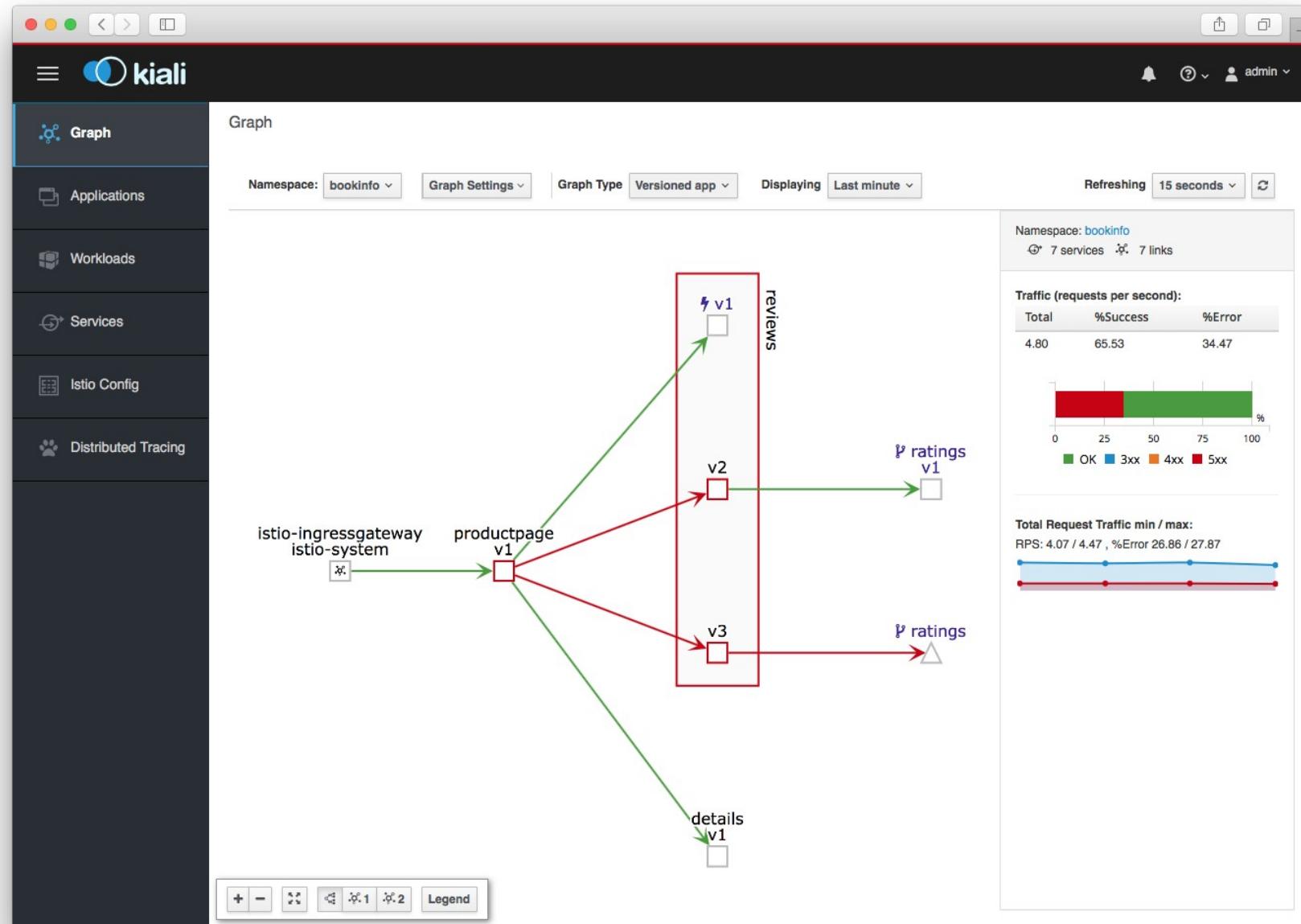


#expoQA19

# Network traffic



#expoQA19



# Demo 5

Testing Kubernetes apps  
with ElasTest

<https://github.com/codeurjc/expoqa19/tree/demo5>



```
node {
```

```
    elastest(  
        tss: ['EUS'], monitoring: true, project: 'ExpoQA19'  
        surefireReportsPattern: '**/target/surefire-reports/TEST-*.*xml', ) {
```

```
        withKubeConfig([credentialsId: 'K8S_TOKEN', serverUrl: '${K8S_URL}')]) {
```

```
            try {
```

```
                stage("Preparation") {
```

```
                    git(  
                        url: 'https://github.com/codeurjc/expoqa19.git',  
                        branch: "${BRANCH}"  
                    )
```

```
                }
```

```
                stage("Create jar") {
```

```
                    sh "docker build . -t expoqa19/webapp2:v1"
```

```
                }
```

```
                stage("Start app") {
```

```
                    sh "./addSutPrefix.sh"
```

```
                    sh "kubectl create -f k8s/"
```

```
                }
```

```
                stage("Test") {
```

```
                    sh "mvn test"
```

```
                }
```

```
            } finally {
```

```
                sh 'kubectl delete -f k8s/'
```

```
                junit "target/*-reports/TEST-*.*xml"
```

```
            }
```

```
        }
```

```
}
```

ElasTest configuration

SUT Identification

# Tests comparison

TJob Execs Comparator x +

localhost:37000/#/projects/26/tjob/175/comparator?execs=449,448

ElasTest Projects / Webapp / JUnit5 Multi Browser Test With MARKS TJob Execs Comparator

Executions to compare

| ID  | Result | Last Execution   | Start Date          | End Date            | Duration(sec) | Mon. Storage | Sut Execution |
|-----|--------|------------------|---------------------|---------------------|---------------|--------------|---------------|
| 449 | FAIL   | Not Executed Yet | 05/02/2019 16:37:36 | 05/02/2019 16:41:12 | 216.93        | mysql        | 248           |
| 448 | FAIL   | Not Executed Yet | 05/02/2019 16:33:35 | 05/02/2019 16:36:54 | 198.557       | mysql        | 247           |

Test Cases Comparison

| Test Case                 | 449     | 448     |
|---------------------------|---------|---------|
| checkTitleAndBodyNotEmpty | FAIL    | FAIL    |
| addMsgAndClear            | SUCCESS | SUCCESS |
| findTitleAndBody          | SUCCESS | SUCCESS |

sut et\_dockbeat cpu totalUsage

"action" Mark View Time View X

Legend

- exec= 449 cpu\_totalUsage
- exec= 448 cpu\_totalUsage

| Action               | exec= 449 cpu_totalUsage | exec= 448 cpu_totalUsage |
|----------------------|--------------------------|--------------------------|
| Submit (checkTit...) | 0.06                     | 0.06                     |
| Assert (checkTit...) | 0.12                     | 0.09                     |
| Submit (addMsgAn...) | 0.08                     | 0.07                     |
| Assert (addMsgAn...) | 0.12                     | 0.12                     |
| Submit (findTit...)  | 0.16                     | 0.09                     |
| Assert (findTit...)  | 0.14                     | 0.11                     |

# Tests comparison



#expoQA19

## Test Results

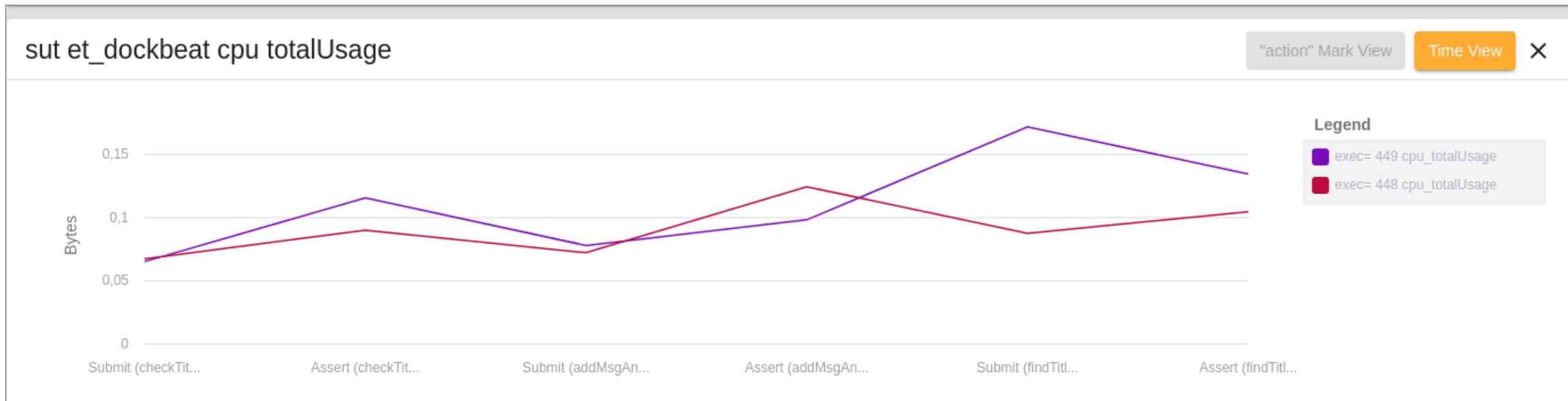
| Test Cases Comparison    |         |         |
|--------------------------|---------|---------|
| Test Case                | 449     | 448     |
| checkTitleAndBodyNoEmpty | FAIL    | FAIL    |
| addMsgAndClear           | SUCCESS | SUCCESS |
| findTitleAndBody         | SUCCESS | SUCCESS |

# Tests comparison



#expoQA19

## Tests metrics



# Tests comparison

## Logs



#expoQA19

TJob Execs Comparator x +

localhost:4200/#/projects/26/tjob/145/comparator?execs=530,529

ElasTest Projects / Webapp / JUnit5 Multi Browser Test TJob Execs Comparator

Log Comparator

test\_default\_log\_log sut\_default\_log\_log AIO

530 | 529

View: Complete logs Tests Logs Failed tests Comparison: Complete No timestamp Time diff Diff Timeout (s) (0 infinite) 0

| Log Line | Left (Red)   | Right (Green)  |
|----------|--|--|
| 1        | Cloning into 'demo-projects'...  | Cloning into 'demo-projects'...  |
| 2        | [INFO] Scanning for projects...  | [INFO] Scanning for projects...  |
| 3        | [INFO] Downloading:  | [INFO] Downloading:  |
| 4        | https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-starter-parent/1.5.8.RELEASE/spring-boot-starter-parent-1.5.8.RELEASE.pom                  | https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-starter-parent/1.5.8.RELEASE/spring-boot-starter-parent-1.5.8.RELEASE.pom                  |
| 5        | [INFO] Downloaded:   | [INFO] Downloaded:   |
| 6        | https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-dependencies/1.5.8.RELEASE/spring-boot-dependencies-1.5.8.RELEASE.pom                      | https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-dependencies/1.5.8.RELEASE/spring-boot-dependencies-1.5.8.RELEASE.pom                      |
| 7        | [INFO] Downloaded:   | [INFO] Downloaded:   |
| 8        | https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-dependencies/1.5.8.RELEASE/spring-boot-dependencies-1.5.8.RELEASE.pom (102 kB at 332 kB/s) | https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-dependencies/1.5.8.RELEASE/spring-boot-dependencies-1.5.8.RELEASE.pom (102 kB at 831 kB/s) |
| 9        | [INFO] Downloading: https://repo.maven.apache.org/maven2/com/fasterxml/jackson/bom/2.8.10/jackson-bom-2.8.10.pom   | [INFO] Downloading: https://repo.maven.apache.org/maven2/com/fasterxml/jackson/bom/2.8.10/jackson-bom-2.8.10.pom   |
| 10       | [INFO] Downloaded: https://repo.maven.apache.org/maven2/com/fasterxml/jackson/bom/2.8.10/jackson-bom-2.8.10.pom (10 kB at 174 kB/s)                                  | [INFO] Downloaded: https://repo.maven.apache.org/maven2/com/fasterxml/jackson/bom/2.8.10/jackson-bom-2.8.10.pom (10 kB at 139 kB/s)                                  |
| 11       | [INFO] Downloading: https://repo.maven.apache.org/maven2/com/fasterxml/jackson/bom/2.8.10/jackson-bom-2.8.10.pom   | [INFO] Downloading: https://repo.maven.apache.org/maven2/com/fasterxml/jackson/bom/2.8.10/jackson-bom-2.8.10.pom   |
| 12       | [INFO] Downloaded: https://repo.maven.apache.org/maven2/com/fasterxml/jackson/bom/2.8.10/jackson-bom-2.8.10.pom (20 kB at 357 kB/s)                                  | [INFO] Downloaded: https://repo.maven.apache.org/maven2/com/fasterxml/jackson/bom/2.8.10/jackson-bom-2.8.10.pom (20 kB at 351 kB/s)                                  |



#expoQA19

# Conclusions

# Conclusions



#expoQA19

- Cloud native apps are complex **distributed applications**
- More **difficult to E2E test** than monoliths  
(distributed systems fallacies)
- **Observability** during E2E testing is key

# Conclusions



#expoQA19

Observability  
in production

!=

Observability  
for E2E testing

# Conclusions



#expoQA19



# Jenkins



Stack



# kubernetes



MADRID 17<sup>th</sup> to 19<sup>th</sup> of JUNE 2019

# ¡Gracias!



International Software Testing & Quality Engineering

## Testing cloud and kubernetes applications

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