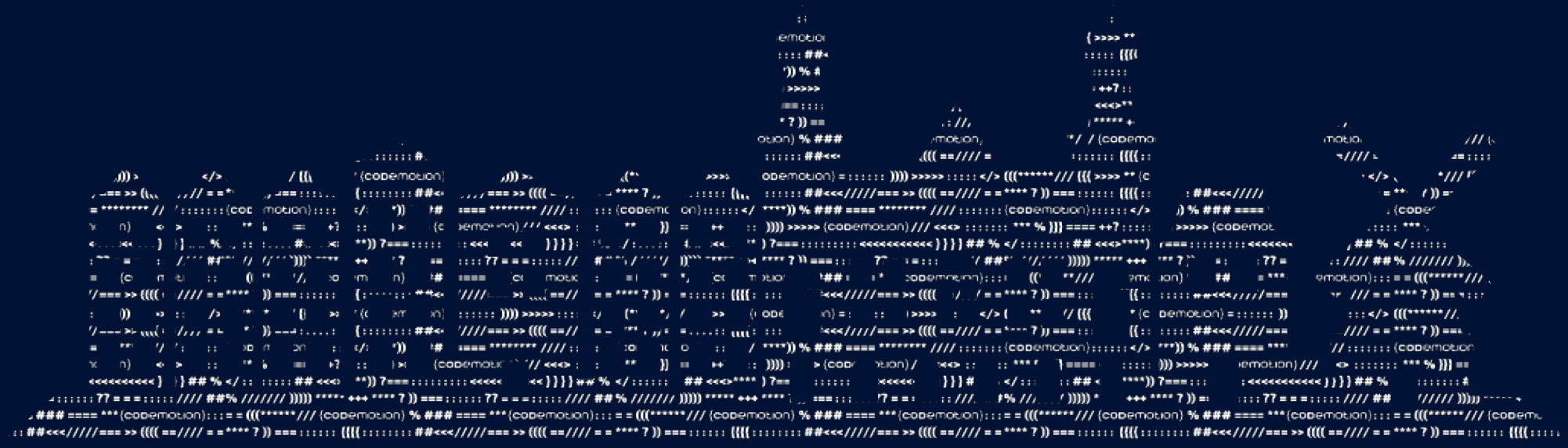
Amsterdam | April 2-3, 2019

{codemotion}

{ Tracing performance with some help of Sleuth, Zipkin & ELK }

Rafaëla Breed

luminis
Conversing worlds

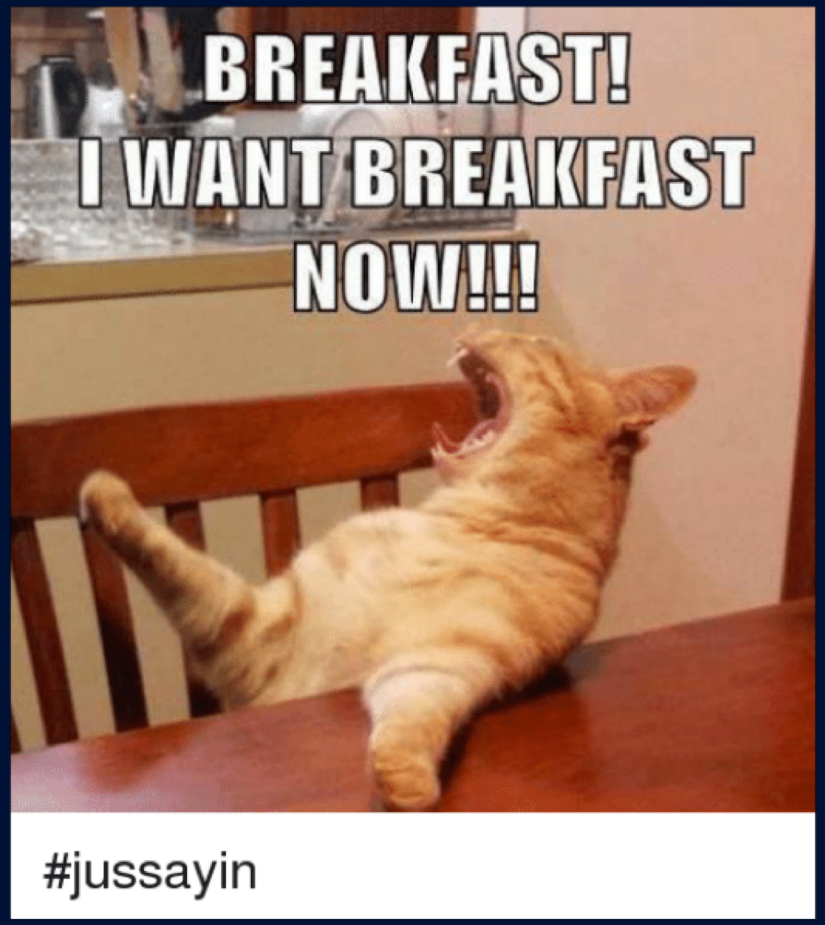


Rafaëla Breed

- Software engineer @ Luminis Amsterdam
- Java developer
- Spring(Boot)
- Photography, traveling

Hmmm… breakfast

New company, new application



Let’s just start developing our application

Everything works fine, but…

…there comes the tester/business/client: 👩‍💻

“It does not work” 🤷‍♂️

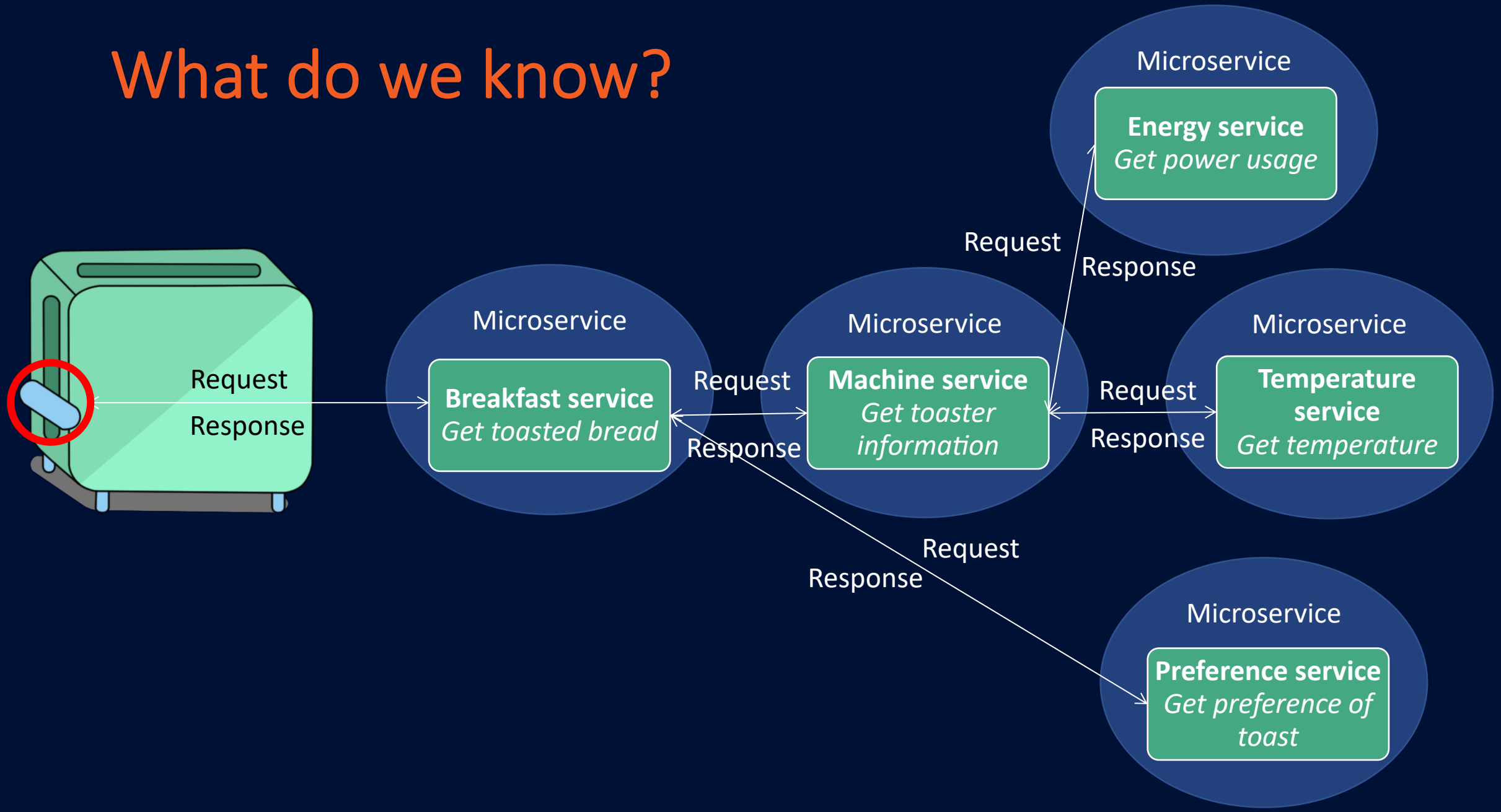
“So, what does not work?” 🕵️‍♀️

“Well, it is slow” 🐌

“All right, do you know which step is being slow exactly?” 🕵️‍♀️

“When I push the toast button, it takes 5 seconds to get the results. That is way too slow. We have to service our customers as fast as possible and ……” 🤦‍♀️

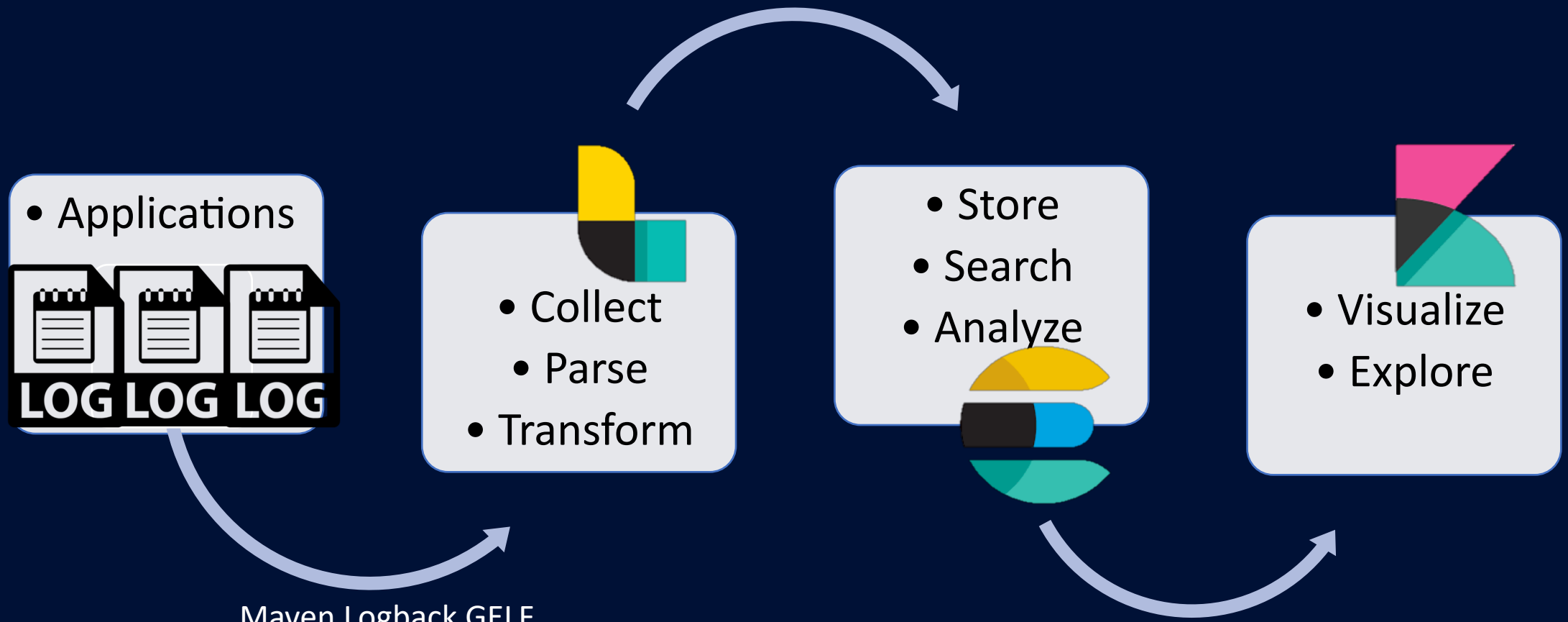
What do we know?



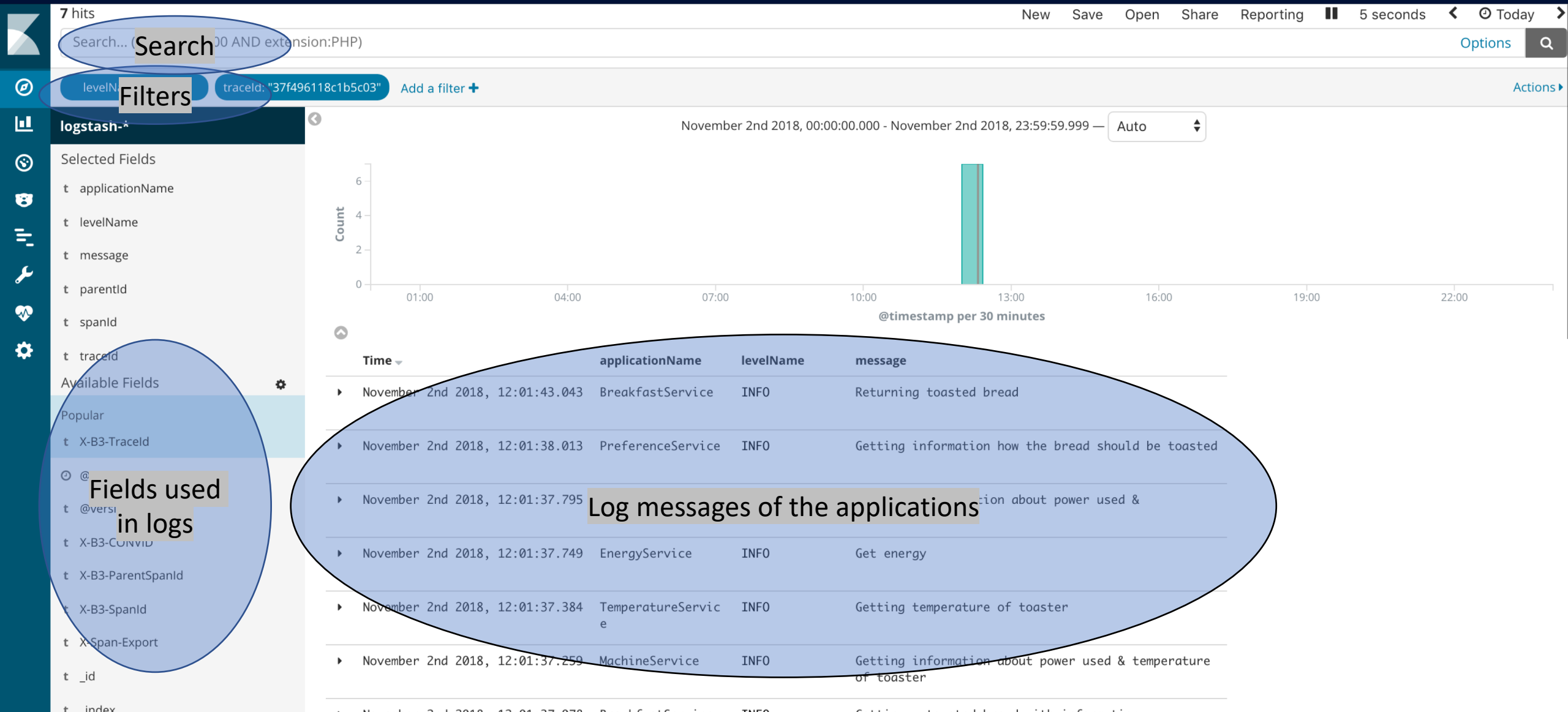
What do we have?

OR Elastic Stack

ELK: ElasticSearch, Logstash, Kibana



Kibana


7 hits
New
Save
Open
Share
Reporting
5 seconds
Today
Search... (
00 AND extension:PHP)
Options
Search
levelN
traceId: "37f496118c1b5c03"
Add a filter +
Actions
Filters
logstash-*
November 2nd 2018, 00:00:00.000 - November 2nd 2018, 23:59:59.999 —
Auto
Selected Fields
t applicationName
t levelName
t message
t parentId
t spanId
t traceId
Count
6
4
2
0
01:00
04:00
07:00
10:00
13:00
16:00
19:00
22:00
@timestamp per 30 minutes
Available Fields
Popular
t X-B3-TraceId
Time
applicationName
levelName
message
November 2nd 2018, 12:01:43.043 BreakfastService INFO Returning toasted bread
November 2nd 2018, 12:01:38.013 PreferenceService INFO Getting information how the bread should be toasted
November 2nd 2018, 12:01:37.795
ion about power used &
Log messages of the applications
November 2nd 2018, 12:01:37.749 EnergyService INFO Get energy
November 2nd 2018, 12:01:37.384 TemperatureServic e INFO Getting temperature of toaster
November 2nd 2018, 12:01:37.259 MachineService INFO Getting information about power used & temperature of toaster
Fields used in logs
t X-B3-ParentSpanId
t X-B3-SpanId
t X-Span-Export
t _id
t _index

Let’s try & dive in our logging

Summary of demo

- Easy search & filter by ELK

- But… Not easy to track specific events… yet

What we would like to have

- Correlation between operations

- Each starting operation => unique id
- Each next operation => unique id

What Sleuth can offer

- Depicted from **Dapper** Infrastructure, **Zipkin**, **Htrace**
- Implementable via **Maven**/**Gradle**
- **Brave** is used as tracing library
- Every **first remote call** starts a **trace** (aka uber-span)
- Every **following remote call** starts a **span** (aka child span)
- Traces are passed to *next service(s)*

Adding Sleuth to your project

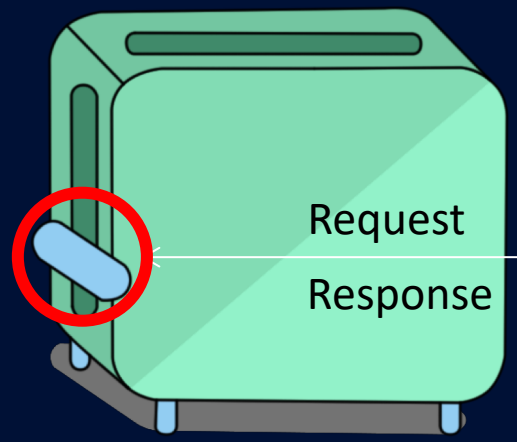
- To every SpringBoot app we add:

```
<dependencyManagement>
    <dependencies>
        <dependency>
            <groupId>org.springframework.cloud</groupId>
            <artifactId>spring-cloud-sleuth</artifactId>
            <version>${spring.cloud.version}</version>
            <type>pom</type>
            <scope>import</scope>
        </dependency>
    </dependencies>
</dependencyManagement>

<dependencies>
    <dependency>
        <groupId>org.springframework.cloud</groupId>
        <artifactId>spring-cloud-starter-sleuth</artifactId>
    </dependency>
</dependencies>
```

- Or take a look at https://cloud.spring.io/spring-cloud-sleuth/
- Using custom log appender(s)? Add the properties X-B3-TraceId and X-B3-SpanId to your configuration!

Summary of demo



Trace

Span A

Breakfast service
Get toasted bread

Span B
Parent Span A

Machine service
Get toaster information

Span C
Parent Span B

Energy service
Get power usage

Span D
Parent Span B

Temperature service
Get temperature

Span E
Parent Span A

Preference service
Get preference of toast

Request
Response
Request
Response
Request
Response
Request
Response
Request
Response

Summary of demo

Time	applicationName	levelName	message	traceId	spanId	parentId
November 2nd 2018, 12:01:43.043	BreakfastService	INFO	Returning toasted bread	37f496118c1b5c03	37f496118c1b5c03	-
November 2nd 2018, 12:01:38.013	PreferenceService	INFO	Getting information how the bread should be toasted	37f496118c1b5c03	fe5f2b53e2cbfdf6	37f496118c1b5c03
November 2nd 2018, 12:01:37.795	MachineService	INFO	Returning information about power used & temperature	37f496118c1b5c03	361368a541a66a2a	37f496118c1b5c03
November 2nd 2018, 12:01:37.749	EnergyService	INFO	Get energy	37f496118c1b5c03	a38d6c2acfb7740f	361368a541a66a2a
November 2nd 2018, 12:01:37.384	TemperatureService	INFO	Getting temperature of toaster	37f496118c1b5c03	131d778df7fa2ef2	361368a541a66a2a
November 2nd 2018, 12:01:37.259	MachineService	INFO	Getting information about power used & temperature of toaster	37f496118c1b5c03	361368a541a66a2a	37f496118c1b5c03
November 2nd 2018, 12:01:37.078	BreakfastService	INFO	Getting a toasted bread with information	37f496118c1b5c03	37f496118c1b5c03	-

Zipkin

- Developed by Twitter in 2012
- Adapted and open-sourced in 2015 as OpenZipkin
- Distributed tracing system
- Trace down your system(s)

Adding Zipkin client to your project

- To every SpringBoot app we add:

```
<!-- Assuming you already added the spring cloud sleuth dependency in your dependencyManagement -->
<dependency>
        <groupId>org.springframework.cloud</groupId>
        <artifactId>spring-cloud-starter-zipkin</artifactId>
</dependency>
```

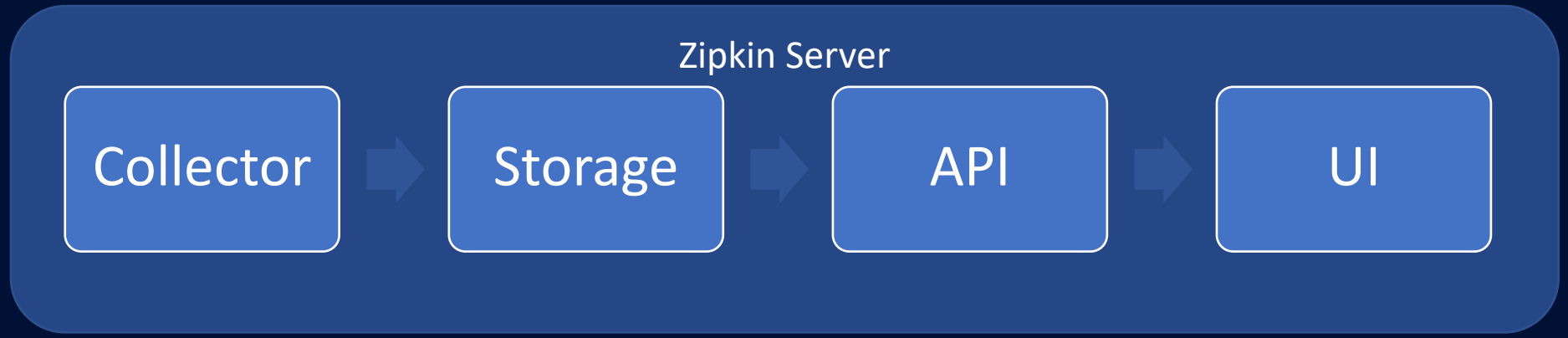
Sampler for Zipkin

- *Do you want to put each request into Zipkin?*

- Up-front decision
- Probability 0…1 → chance 0 to 100%
- Default = ProbabilityBasedSampler 0.1
- ALWAYS_SAMPLE
- Custom declarative sampling
- Custom sampling on request
- Rate-limiting sampler
- X-B3-Flags overrides (client request header)

Getting a Zipkin server

- Github project
- Docker images (production ready)
- Cloud solutions for AWS/Azure available

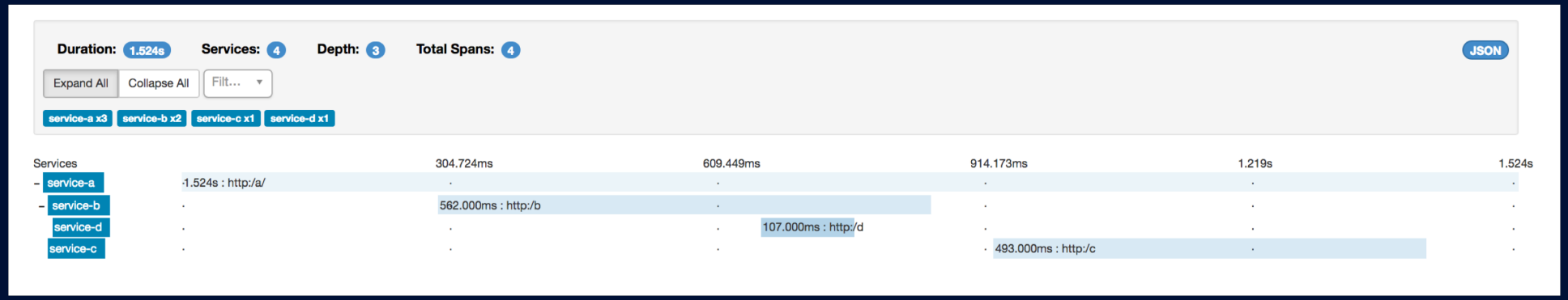


Summary of demo

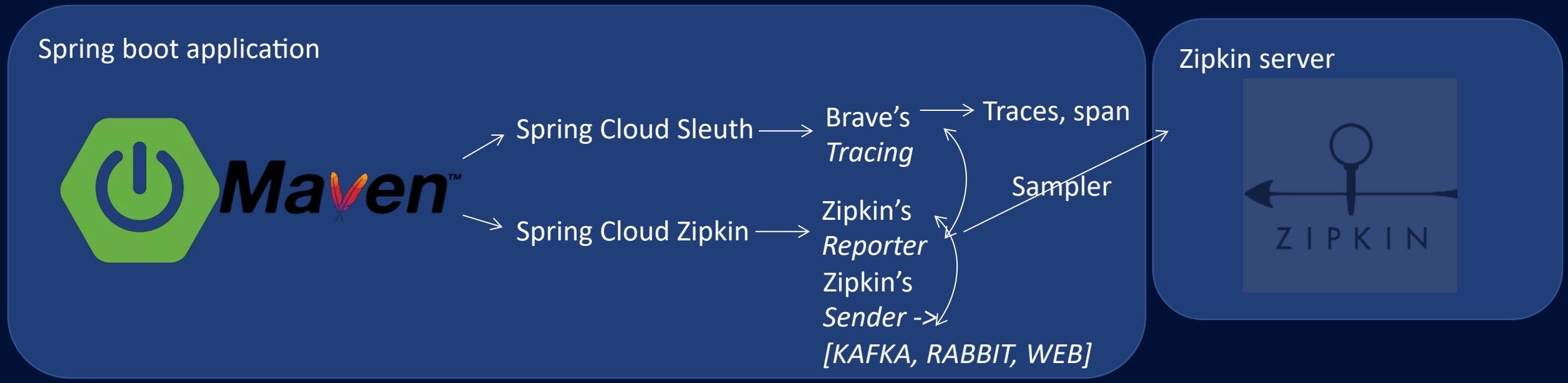
- The **Zipkin client** sends enriched information of Sleuth to your **Zipkin Server**
- The Zipkin Server provides a **user interface** in which you can overview the details of the events logged by Sleuth/Zipkin Client

Summary of demo

- The user interface with clear **graphics** of events with times



Overview what will happen (a bit under the hood)



Our Cucumber tests

- TDD, business scenario’s
- Logs tests & apps available

```
Feature: get a breakfast
  As a customer
  I want to get a breakfast
  So that I will start the day well

  Scenario:
    Given a customer
    When a customer want a toasted bread
    And a good cup of coffee
    And a fried egg
    And some bacon
    Then he gets a wonderful breakfast
```

Our test log

```
org.awaitility.core.ConditionTimeoutException: Condition with lambda expression in eu.luminis.breed.sleuthzipkin.selenium.BreakfastPage was not fulfilled within 5 seconds.
        at org.awaitility.core.ConditionAwaiter.await(ConditionAwaiter.java:145)
        at org.awaitility.core.CallableCondition.await(CallableCondition.java:79)
        at org.awaitility.core.CallableCondition.await(CallableCondition.java:27)
        at org.awaitility.core.ConditionFactory.until(ConditionFactory.java:902)
        at org.awaitility.core.ConditionFactory.until(ConditionFactory.java:860)
        at eu.luminis.breed.sleuthzipkin.selenium.BreakfastPage.fryEgg(BreakfastPage.java:47)
        at eu.luminis.breed.sleuthzipkin.selenium.PageStepDefinitions.aFriedEgg(PageStepDefinitions.java:48)
        at ✽.a fried egg(file:src/test/resources/breakfast-service.feature:10)

[ERROR] Tests run: 1, Failures: 0, Errors: 1, Skipped: 0, Time elapsed: 19.43 s <<< FAILURE! - in eu.luminis.breed.sleuthzipkin.selenium.BreakfastPageTest
[ERROR] EMPTY_NAME(get a breakfast)  Time elapsed: 18.885 s  <<< ERROR!
org.awaitility.core.ConditionTimeoutException: Condition with lambda expression in eu.luminis.breed.sleuthzipkin.selenium.BreakfastPage was not fulfilled within 5 seconds.

[INFO]
[INFO] Results:
[INFO]
[ERROR] Errors:
[ERROR]   Condition with lambda expression in eu.luminis.breed.sleuthzipkin.selenium.BreakfastPage was not fulfilled within 5 seconds.
[INFO]
[ERROR] Tests run: 1, Failures: 0, Errors: 1, Skipped: 0
[INFO]
[INFO] ------------------------------------------------------------------------
[INFO] BUILD FAILURE
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 24.414 s
[INFO] Finished at: 2019-04-01T13:42:38+02:00
[INFO] Final Memory: 41M/339M
[INFO] ------------------------------------------------------------------------
```

Our test report

▼ **Feature**: get a breakfast

As a customer
I want to get a breakfast
So that I will start the day well

▼ **Scenario**:

Given a customer
When a customer want a toasted bread
And a good cup of coffee
And a fried egg

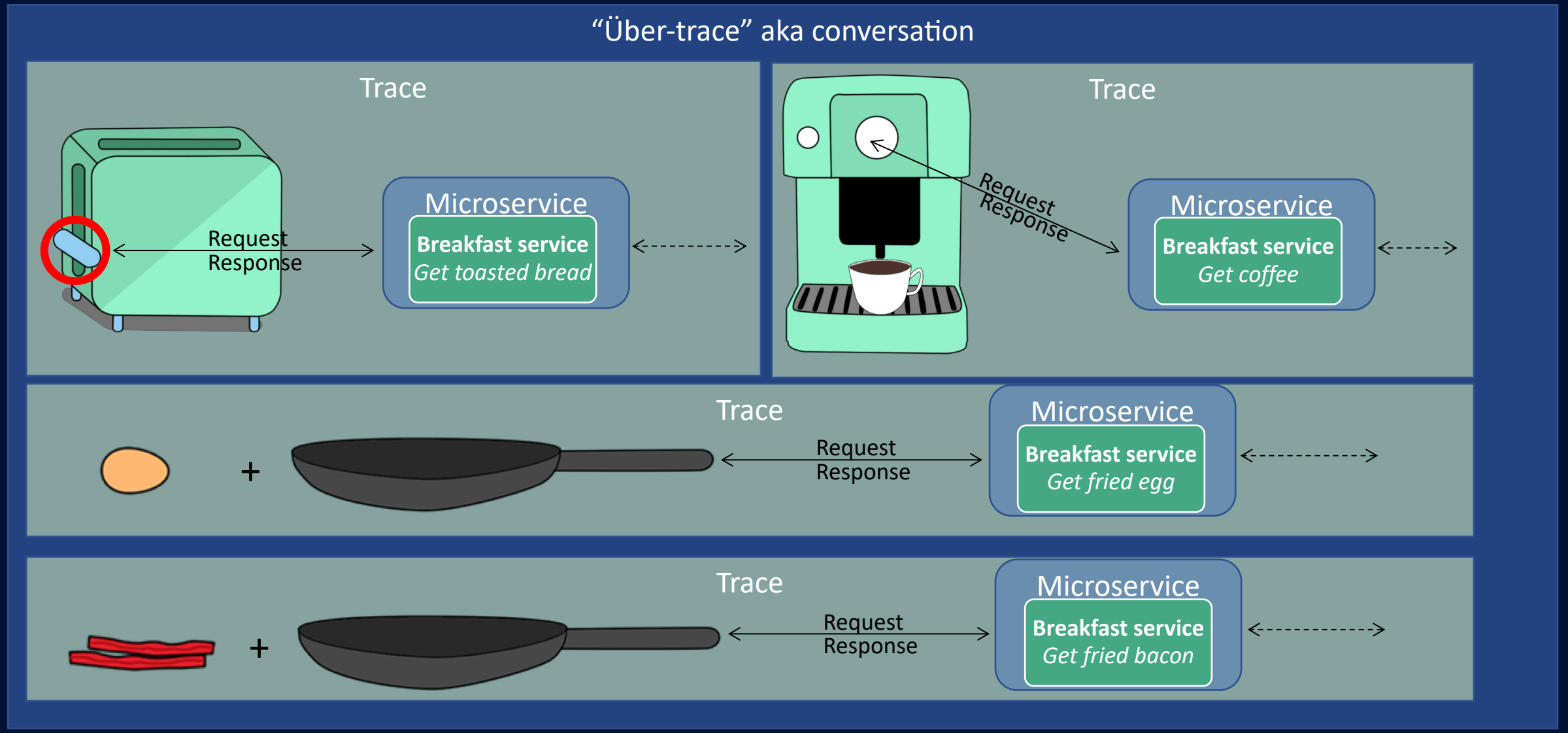
```
org.awaitility.core.ConditionTimeoutException: Condition with lambda expression in eu.luminis.breed.sleuthzipkin.selenium.BreakfastPage was not fulfilled
        at org.awaitility.core.ConditionAwaiter.await(ConditionAwaiter.java:145)
        at org.awaitility.core.CallableCondition.await(CallableCondition.java:79)
        at org.awaitility.core.CallableCondition.await(CallableCondition.java:27)
        at org.awaitility.core.ConditionFactory.until(ConditionFactory.java:902)
        at org.awaitility.core.ConditionFactory.until(ConditionFactory.java:860)
        at eu.luminis.breed.sleuthzipkin.selenium.BreakfastPage.fryEgg(BreakfastPage.java:47)
        at eu.luminis.breed.sleuthzipkin.selenium.PageStepDefinitions.aFriedEgg(PageStepDefinitions.java:48)
        at *.a fried egg(file:src/test/resources/breakfast-service.feature:10)
```

And some bacon
Then he gets a wonderful breakfast

Our application logs

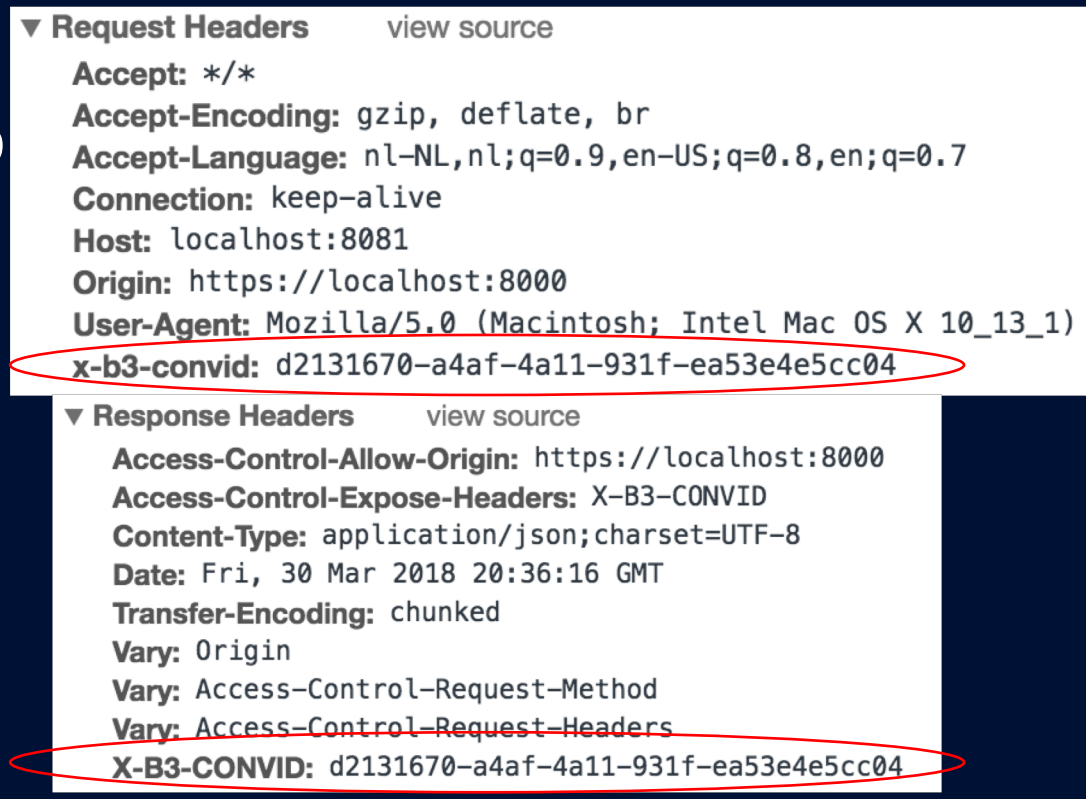
▸	April 2nd 2018, 21:20:46.628	Breakfast Service	Getting a fried egg with some information	f8bf9b99012e95e1	f8bf9b99012e95e1
▸	April 2nd 2018, 21:20:46.555	Breakfast Service	Returning toasted bread	ab03e10dc971a506	ab03e10dc971a506
▸	April 2nd 2018, 21:20:41.549	PreferenceService	Getting information how the bread should be toasted	ab03e10dc971a506	c7d82cdf6d4fa034
▸	April 2nd 2018, 21:20:41.548	PreferenceService	FrameworkServlet 'dispatcherServlet': initialization completed in 20 ms	-	-
▸	April 2nd 2018, 21:20:41.528	PreferenceService	FrameworkServlet 'dispatcherServlet': initialization started	-	-
▸	April 2nd 2018, 21:20:41.526	PreferenceService	Initializing Spring FrameworkServlet 'dispatcherServlet'	-	-

Our future wishes



Conversation ID specs

- Client may pass **request header** as **X-B3-ConvID**
- If not passed → application **creates** it
- **Subsequent** calls of services receive it & use it
- **Loggable** & passed to **Zipkin** → searchable
- Client **response header** has X-B3-ConvID

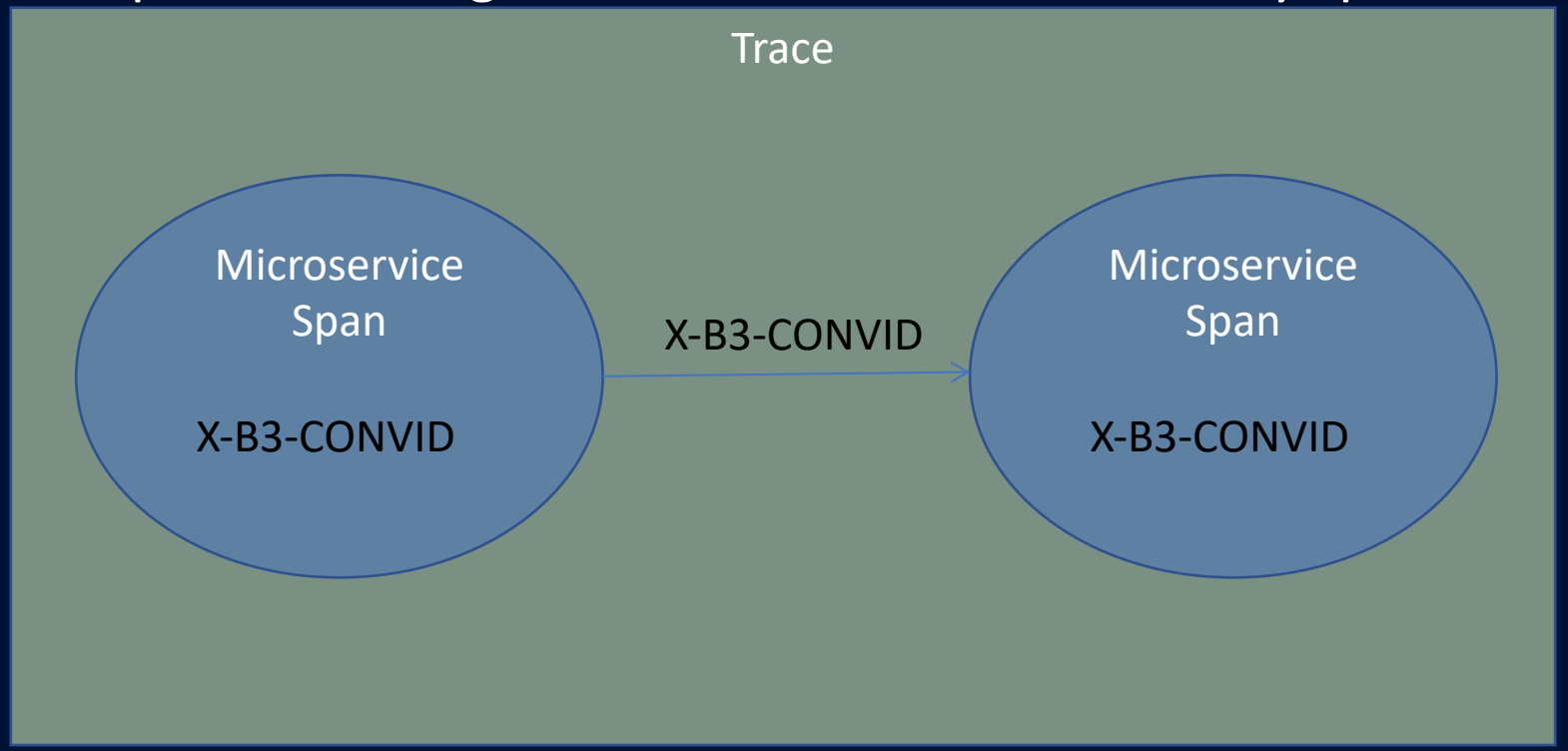


Adding a custom tracefilter

- Extend your class with **GenericFilterBean**
- Ensure that the @Order is *before* or *after* TraceWebServletAutoConfiguration**.TRACING_FILTER_ORDER**, dependent on what you want to provide

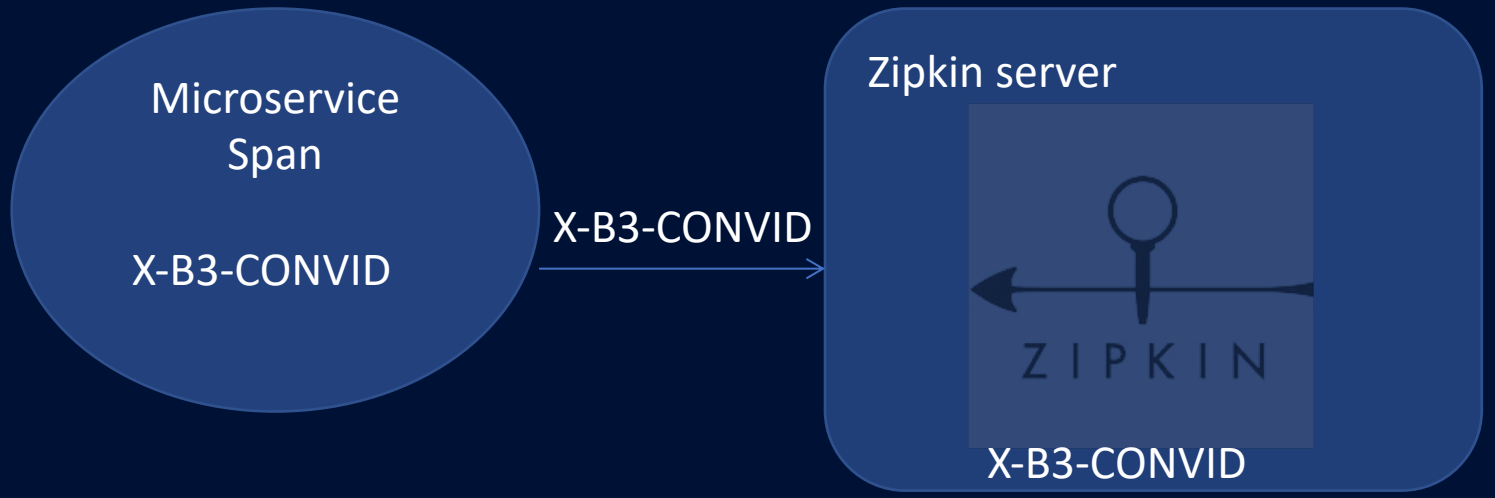
Propagation fields

- Or bagage
- Addable fields passed through services with trace and every span



Tags

- Addable fields for specific span for details / lookup
- Will be passed to Zipkin



Summary of demo

- Manipulate pass through of Sleuth with a custom **filter**
- **Propagation fields** will be passed to the whole trace
- A **tag** is used to tag a span & is also passed to Zipkin
- Make conversation id or trace id available in your reports!

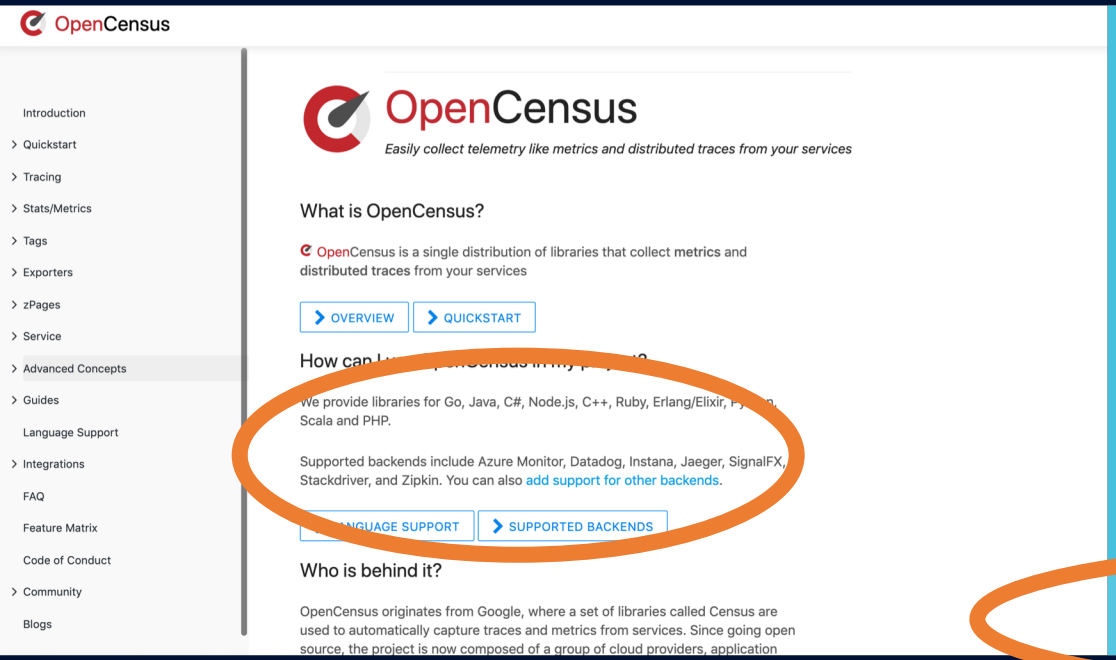
But...

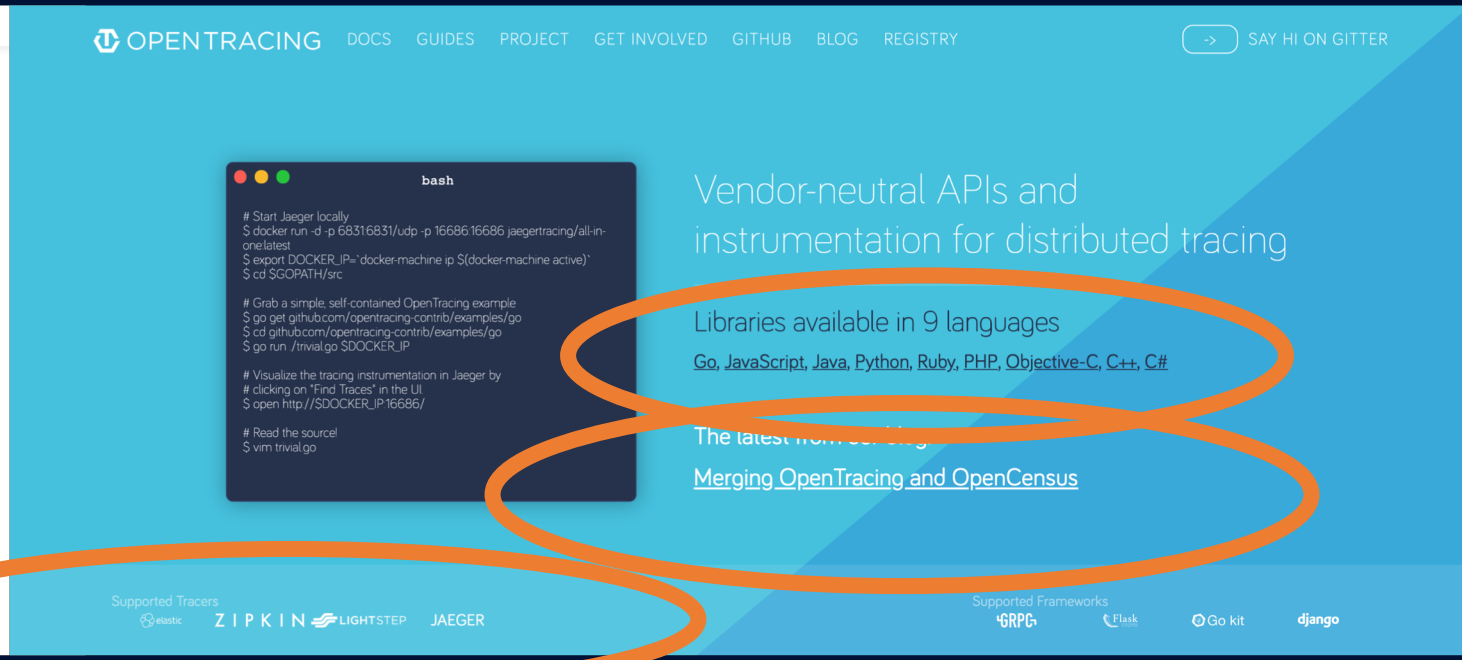
…what about applications without Spring Boot?

…what about applications without Java?

…are there alternatives to Zipkin?

Distributed tracing
opencencus.io & opentracing.io

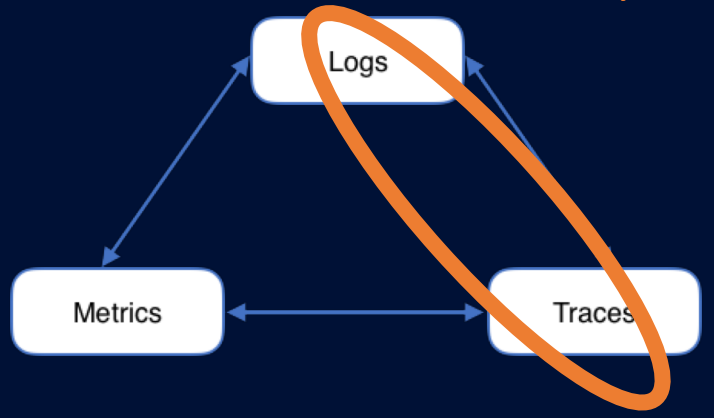




Summary

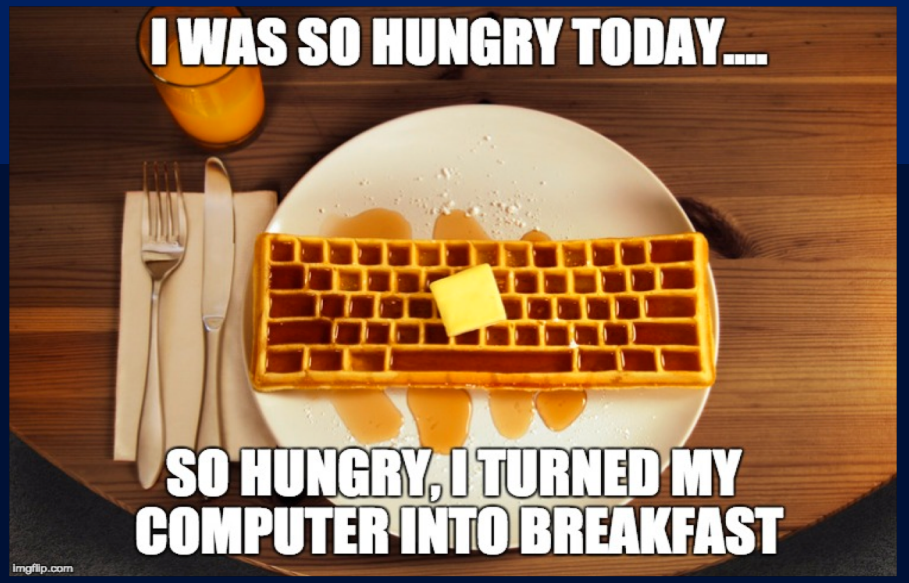
- Easy **review** of application calls with ELK, Sleuth, Zipkin
- More clear **separation** of events by traces & spans with Sleuth
- More easy search for **performance latencies** by visualization in Zipkin
- **Extra information** by extra custom interceptors/filters
- **Logging** and **tracing** will go hand-in-hand

Golden circle of observability



Thank you for your time!

- Questions?
- Please give feedback in the app
- Presentation & code at https://github.com/RDBreed/sleuthzipkindemo



Observability & serverless?
14:10-14:50 by Yan Cui @ room 2