



Visualization in Serverless Applications

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> whoami



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Cyber-Security @ IDF

Raising a guide dog 

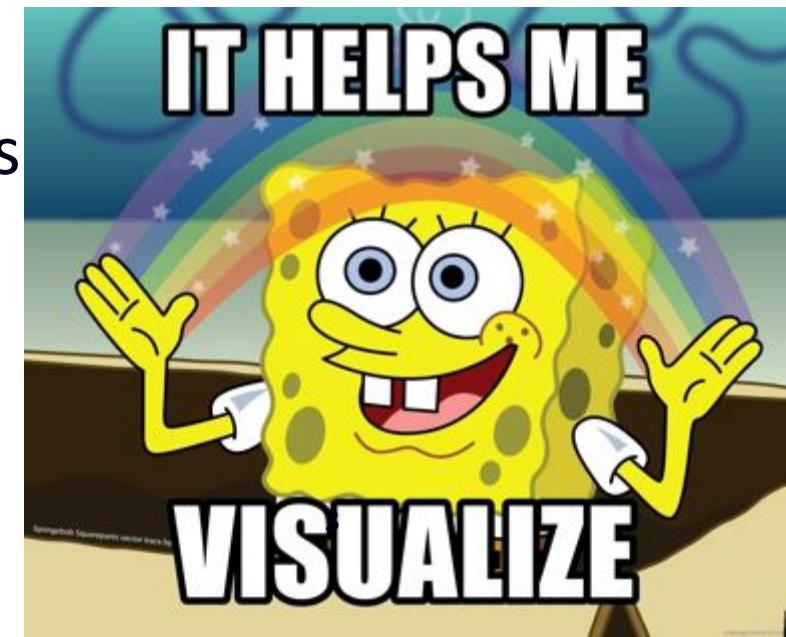
<----- Looking for whales in Hawaii 

What we'll discuss today

Serverless, managed resources and distributed applications

Distributed tracing in a nutshell

Vizualization in ~~serverless~~ distributed applications

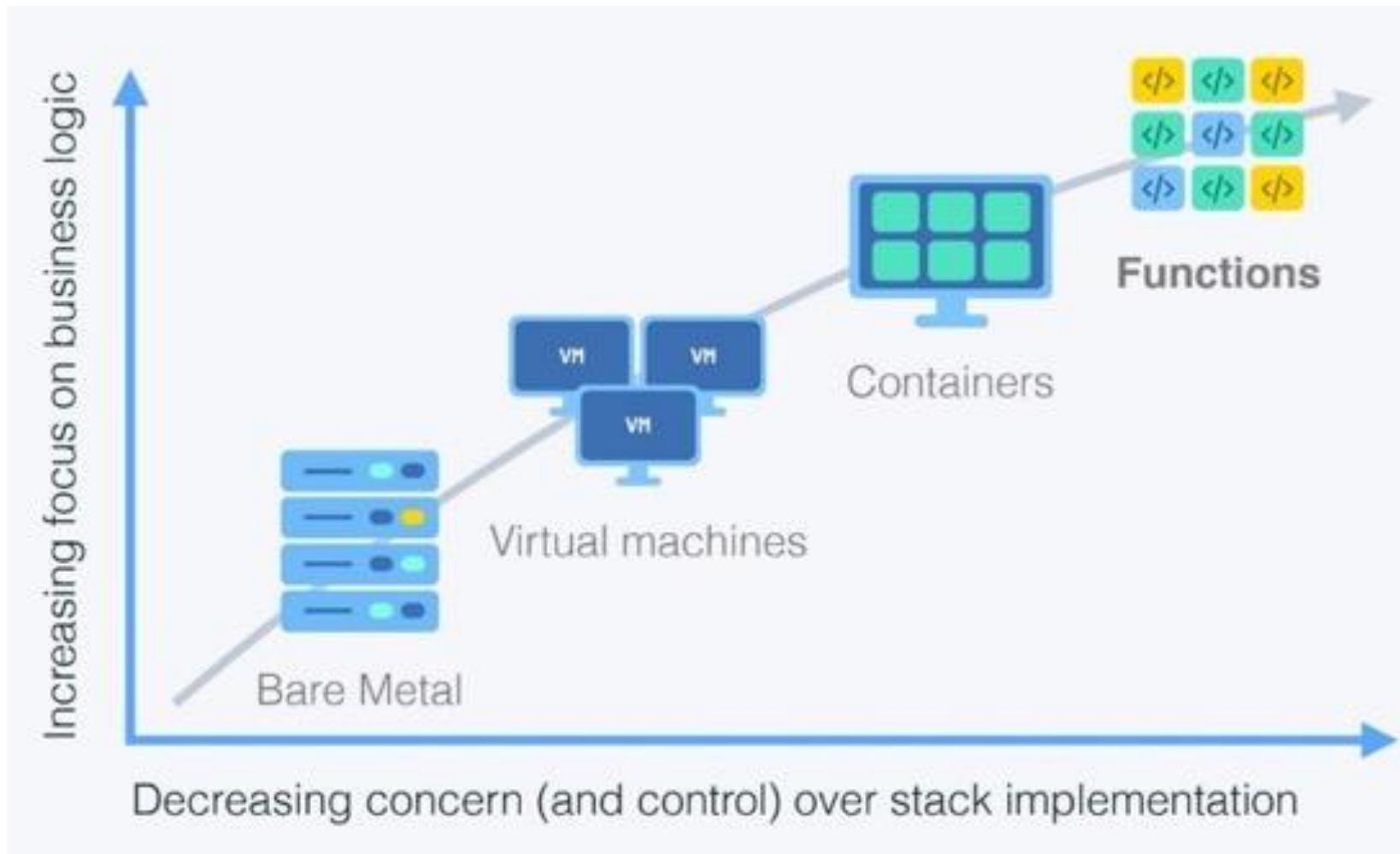




Server
?

Less

The evolution to serverless

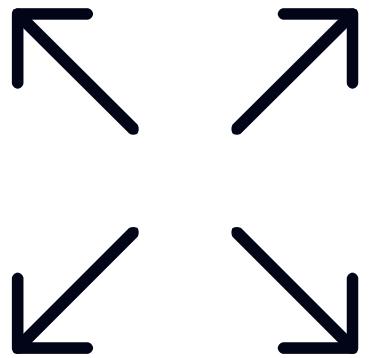


What is Serverless?

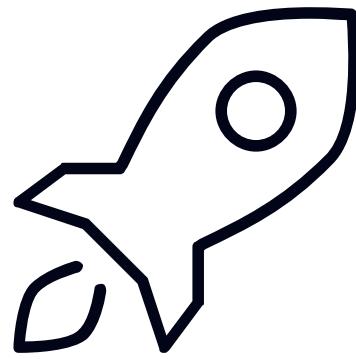


```
Serverless = {  
    managed_comptue: [FaaS, CaaS],  
    managed_resources: [DBs, MQs, ML, ...],  
    managed_apis: [billing, comms, auth]  
}
```

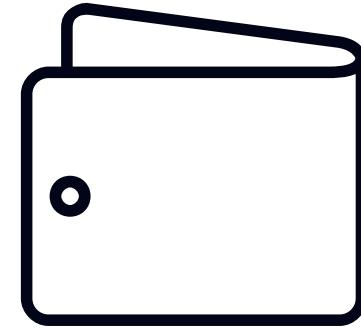
Why serverless?



Scale
out-of-the-box



Dev
velocity



Pay-per-use

The limitations of FaaS



Limited memory



Limited running time



Stateless

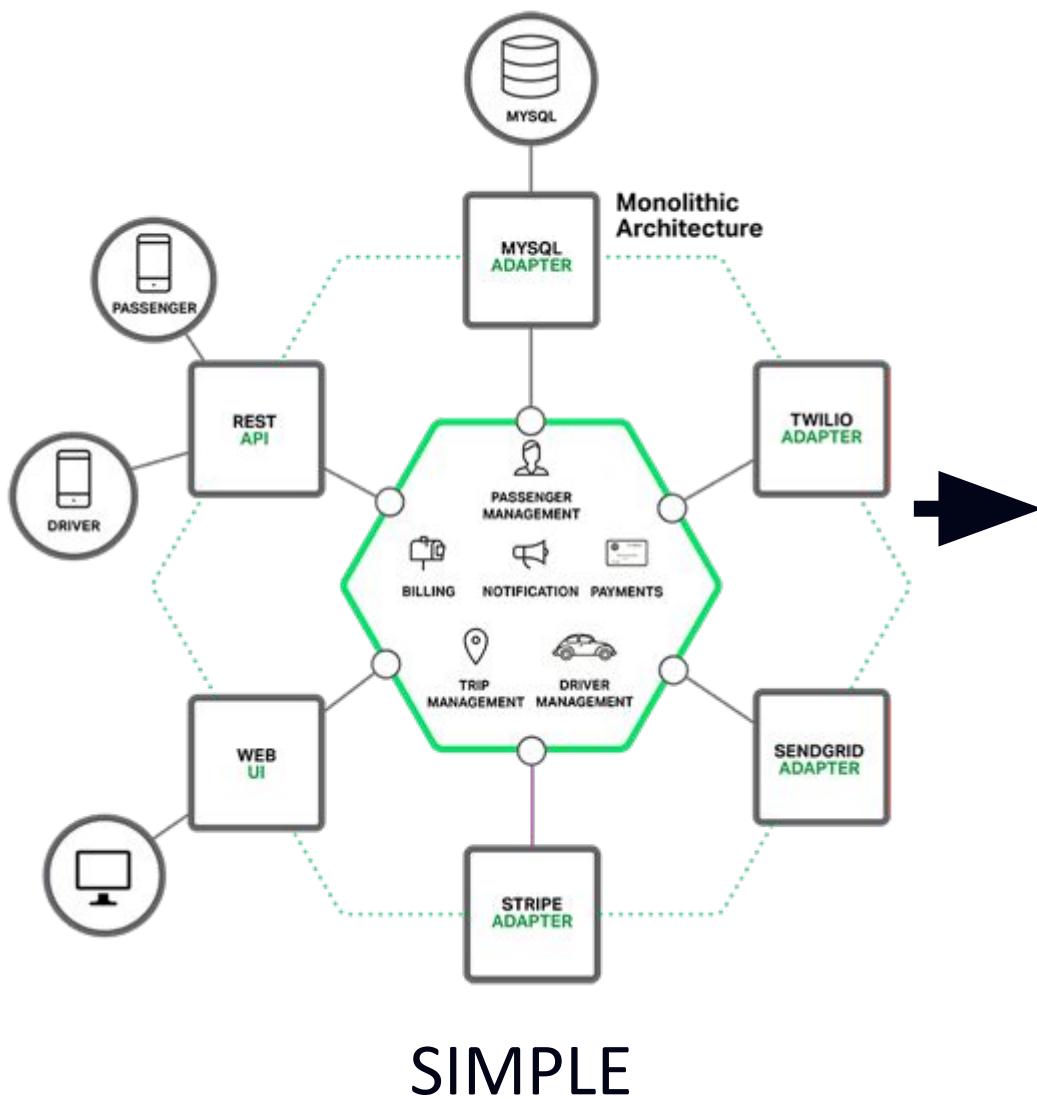


Cold starts

+ concurrency limit

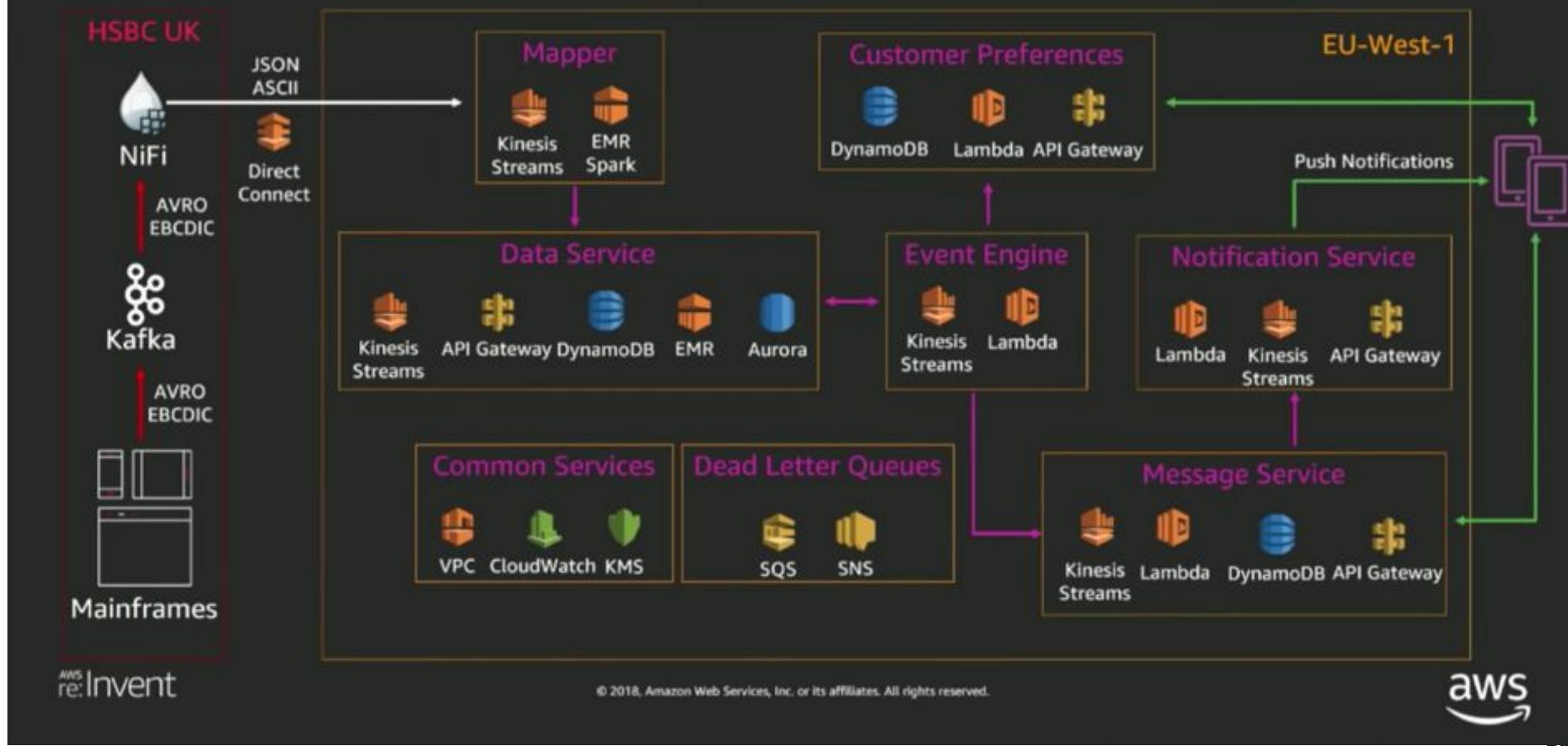
+ some others...

Monolith to microservices



Modern distributed application

Solution Overview



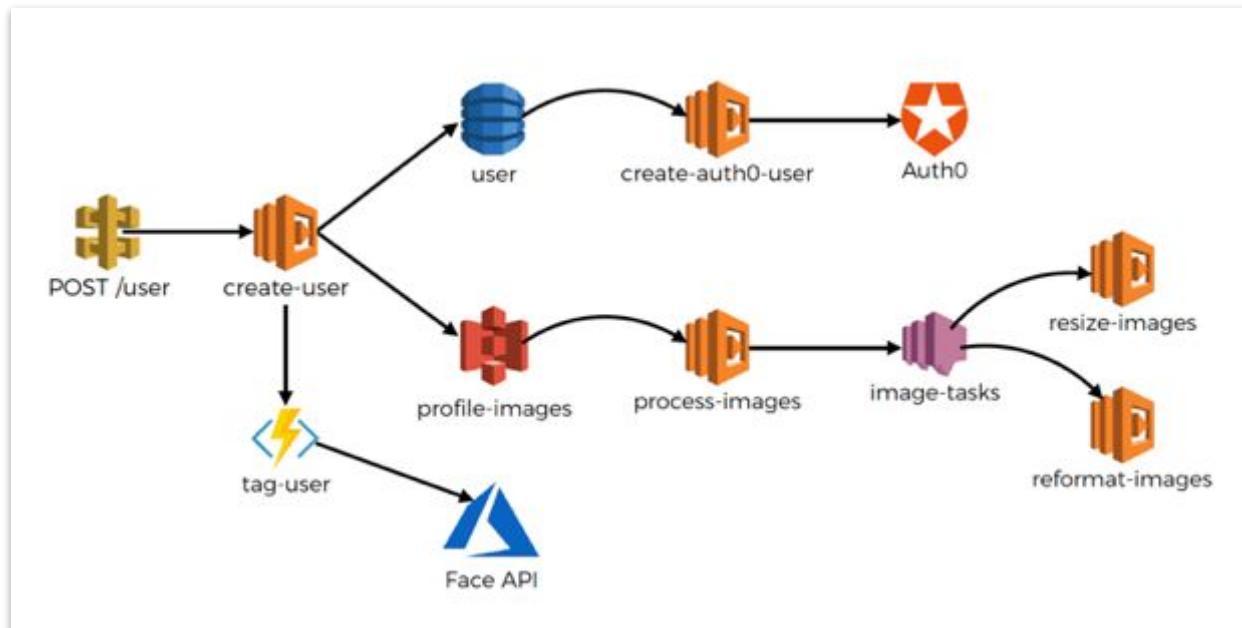
Source: re:Invent 2018, HSBC

Managed / micro-services environments challenges

Event-drive design

No server to connect to – difficult to troubleshoot

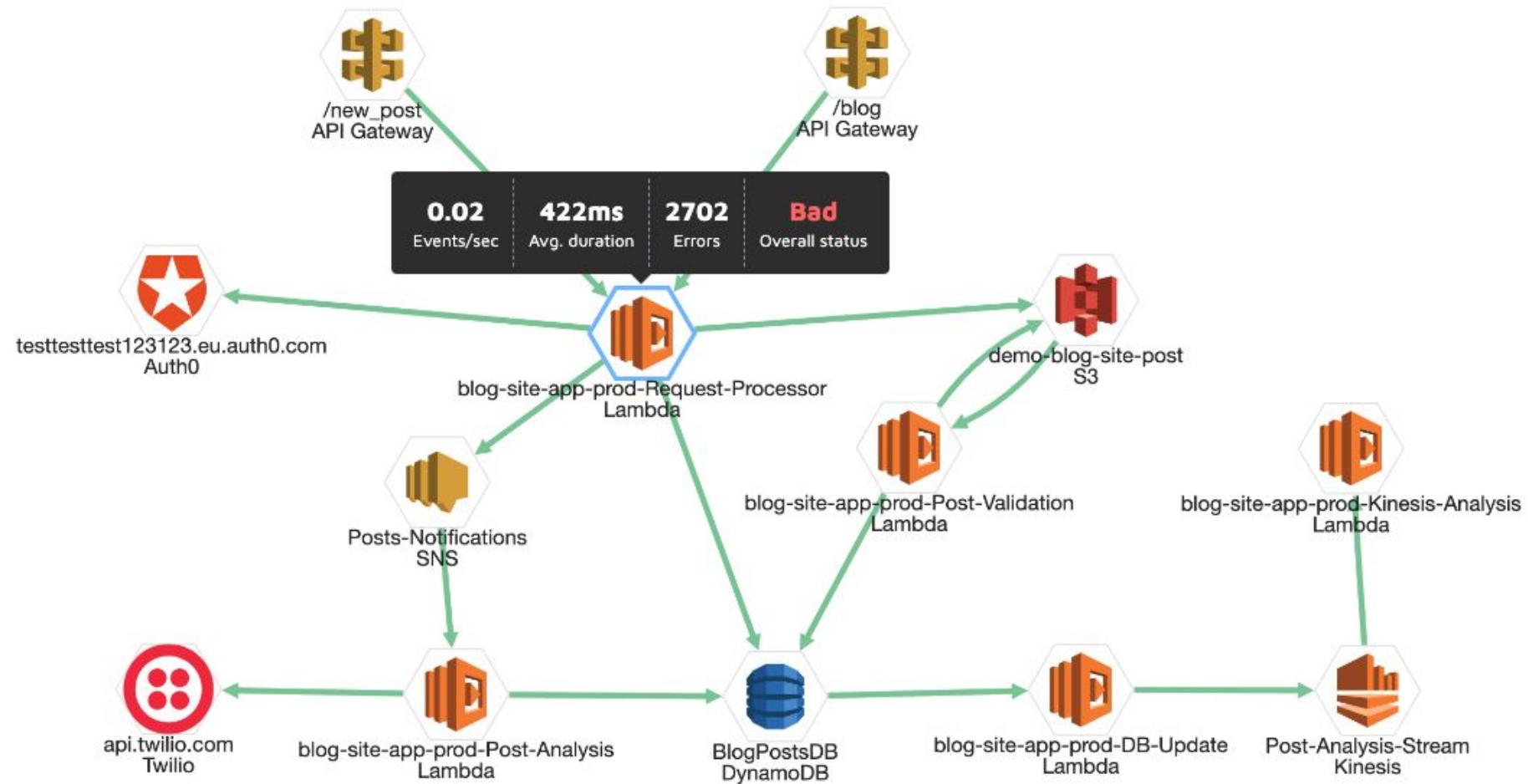
End-to-end metrics – difficult to determine system health



Scenario #1: Performance monitoring in distributed apps

#1

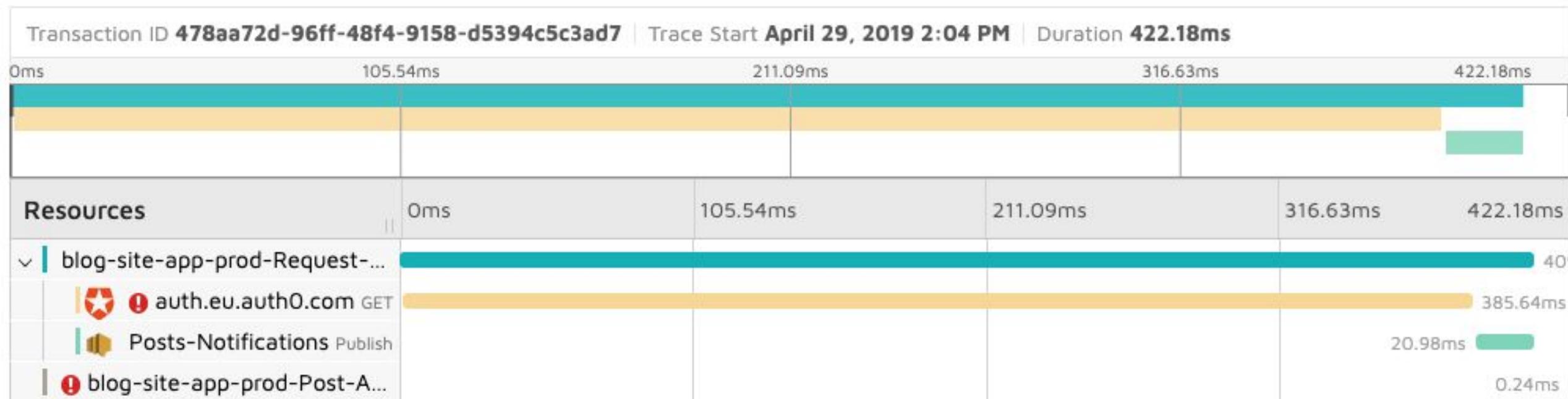
Slow response



Where the code spends time? 🤔

Timeline view

#2



Scenario #2: Troubleshooting distributed apps





Sentry APP 13:30

JSONDecodeError: Expecting value: line 1 column 1 (char 0)

Culprit

simplejson.decoder in raw_decode

Project

tracking-service

Environment

production

Lambda

tracking-service-production-update-last-session

Search for log entries... (e.g. host.name:host-1) Customize

11/08/2018 8:15:41 PM

Stream live

2018-11-08 20:14:56.309	redis Connecting to MASTER redis-master:6379	
2018-11-08 20:14:58.378	redis MASTER <-> SLAVE sync started	09 AM
2018-11-08 20:15:04.000	apache2 192.168.65.3 - "GET /guestbook.php?cmd=set&key=messages&value=Lorem+ipsum+dolor+sit+amet%2C+consectetur+adipiscing.+B%27duis%27+b%27mi%27+b%27a%27+b%27quam%27.+B%27eget%27+b%27adh%27+b%27a%27+ HTTP/1.1" 200 255	
2018-11-08 20:15:04.000	apache2 192.168.65.3 - "GET / HTTP/1.1" 200 826	
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2018-11-08 20:15:16.000	REPLCONF ACK 13902	
2018-11-08 20:15:17.000	apache2 192.168.65.3 - "GET / HTTP/1.1" 200 826	
2018-11-08 20:15:17.000	apache2 192.168.65.3 - "GET /guestbook.php?cmd=set&key=messages&value=Lorem+ipsum.+B%27amet%27+b%27ac%27.+B%27orci%27+b%27ut%27.+B%27pede%27+b%27eu%27+b%27ac%27+b%27quam%27+b%27a%27+b%27enim%27+b%27a%27.+ HTTP/1.1" 200 255	
2018-11-08 20:15:19.000	REPLCONF ACK 14037	
2018-11-08 20:15:20.000	apache2 192.168.65.3 - "GET /guestbook.php?cmd=set&key=messages&value=Lorem+ipsum+dolor+sit+amet%2C+consectetur+adipiscing.+B%27arcu%27+b%27ut%27+b%27a%27+b%27a%27+b%27taciti%27+b%27a%27.+B%27 HTTP/1.1" 200 255	03 PM
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2018-11-08 20:16:00.000	apache2 192.168.65.3 - "GET / HTTP/1.1" 200 826	
2018-11-08 20:16:01.000	apache2 192.168.65.3 - "GET /guestbook.php?cmd=set&key=messages&value=Lorem+ipsum+dolor+sit+amet.+B%27eget%27+b%27ac%27.+B%27elit%27+b%27ad%27+b%27a%27+b%27nis%27+b%27a%27+b%27velit%27+b%27eget%27+b%27a HTTP/1.1" 200 255	06 AM
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A scene from Toy Story featuring Woody and Buzz Lightyear. Woody, on the left, has a neutral expression and is wearing his signature brown vest over a yellow and black plaid shirt. Buzz, on the right, is in his space ranger suit with a determined or excited expression, pointing his right hand towards the sky. The background shows a room with a blue wall and a doorway.

LOGS

LOGS EVERYWHERE

What is missing?

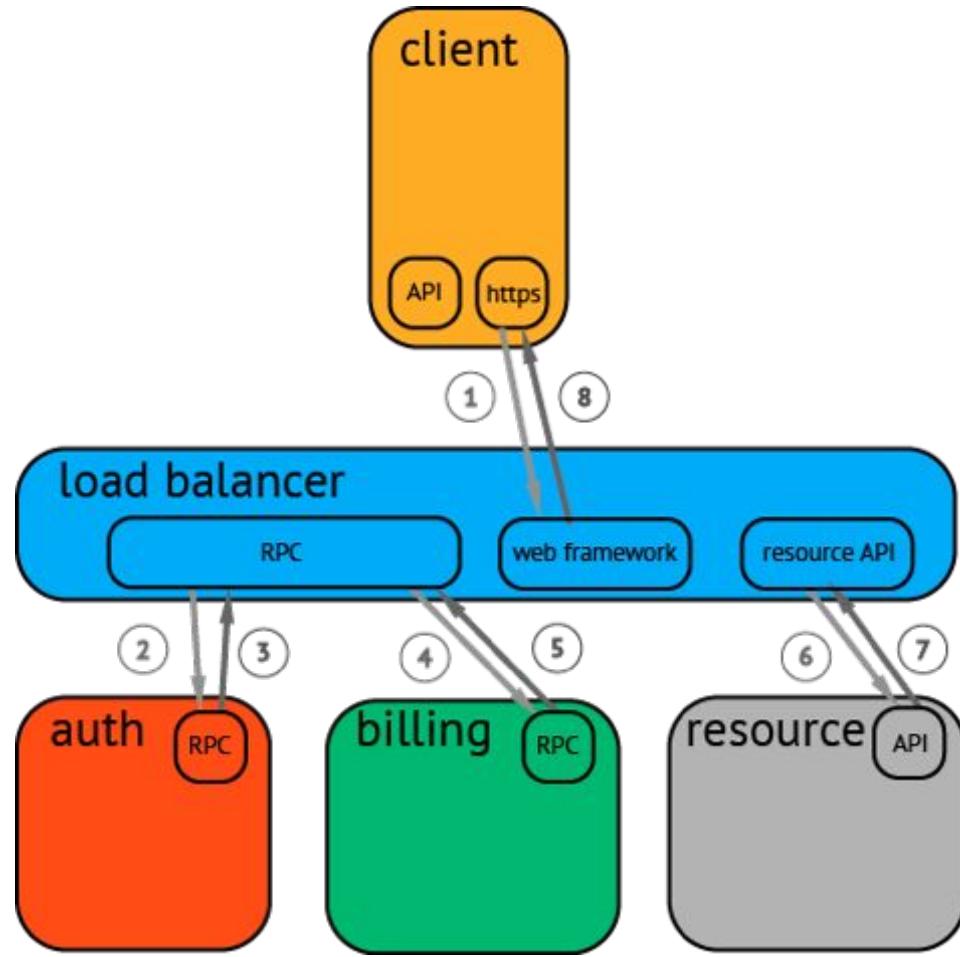
Too many resources = Too many logs

Hard to get the context out of logs

...

Introducing – distributed tracing + auto-instrumentation

Distributed tracing



...a **trace** tells the story of a transaction or workflow as it propagates through a (potentially distributed) system.
Distributed tracing is a method used to profile and monitor applications.

Implementing distributed tracing

Without an
agent

Manual tracing/instrumentation

Before/after calls

Between every micro-service

High maintenance

High potential of errors (or missing them)



```
def handle_request(request):
    span = before_request(request, opentracing.global_tracer())
    with tracer.scope_manager.activate(span, True) as scope:
        handle_request_for_real(request)

def before_request(request, tracer):
    span_context = tracer.extract(
        format=Format.HTTP_HEADERS,
        carrier=request.headers,
    )
    span = tracer.start_span(
        operation_name=request.operation,
        child_of(span_context))
    span.set_tag('http.url', request.full_url)

    remote_ip = request.remote_ip
    if remote_ip:
        span.set_tag(tags.PEER_HOST_IPV4, remote_ip)

    caller_name = request.caller_name
    if caller_name:
        span.set_tag(tags.PEER_SERVICE, caller_name)

    remote_port = request.remote_port
    if remote_port:
        span.set_tag(tags.PEER_PORT, remote_port)

    return span
```

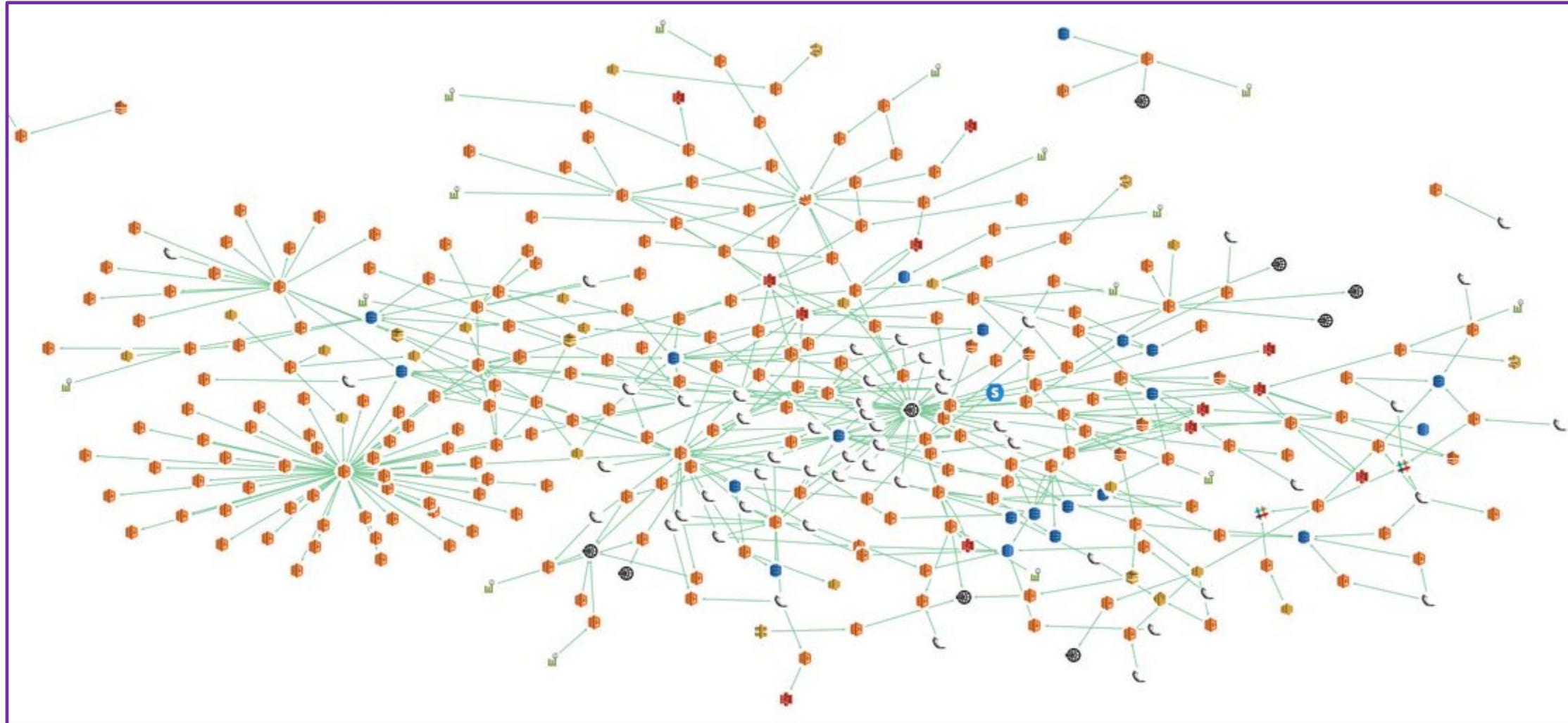
Serverless apps are **very** distributed

- Lots of functions and services
- Plenty of managed resources
- Many 3rd party APIs

What about the **developer velocity**?

#1

Seriously... they are distributed!



The right way to troubleshoot distributed applications

Search for log entries... (e.g. host.name:host-1) Customize

11/08/2018 8:15:41 PM

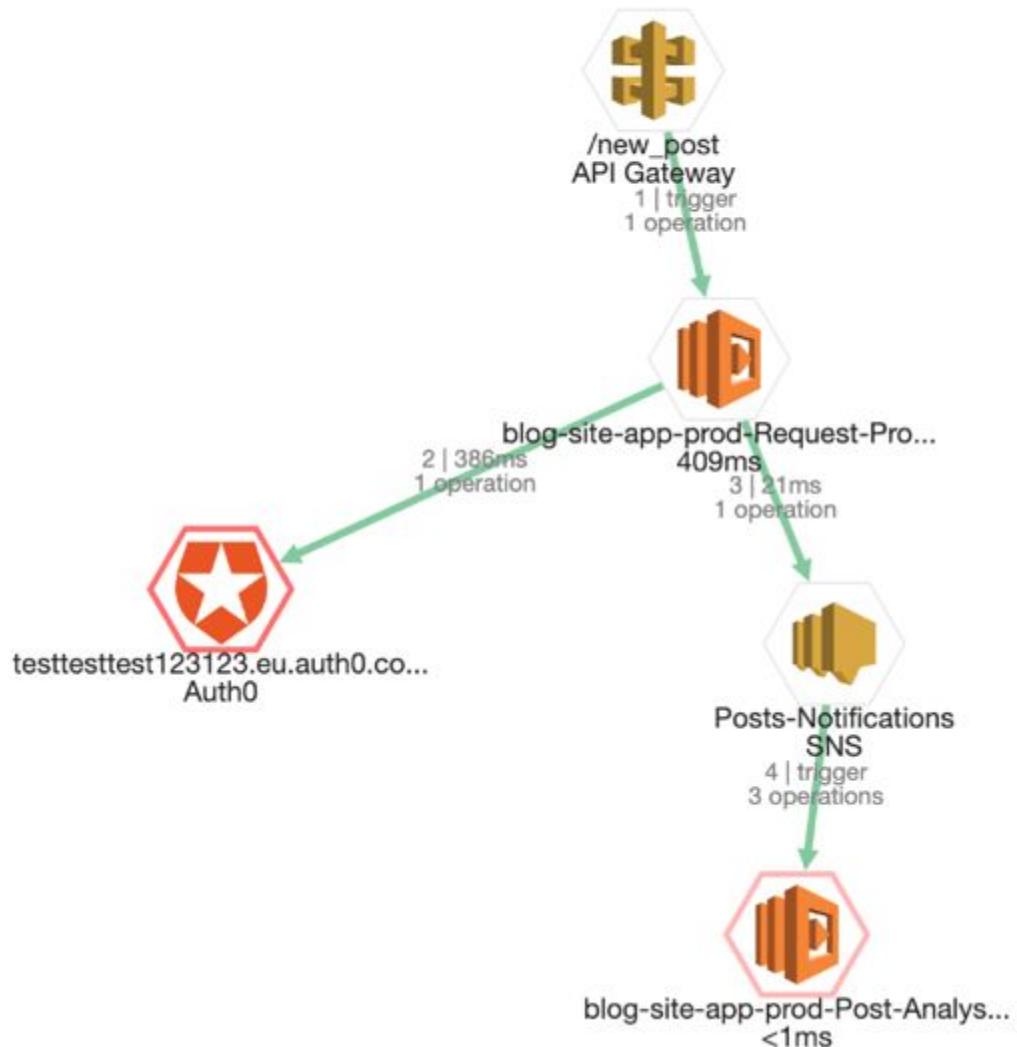
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Trace's Story

Architecture View



Resource Details (1 operation)

GET Operation on testtesttest123123.eu.auth0.com

Resource Data

Event Date: 4/29/2019 2:04:20 PM

Duration: 385.639 ms

url: [Show log](#)

Status Code: 401

Response Body: { 4 items }

```

    "error" : "Unauthorized"
    "message" : "Expired token received for JSON Web Token validation"
    "attributes" : {...} 1 item
    "statusCode" : 401
  }
  
```

Request Headers: { ... } 5 items

Response Headers: { 8 items }

```

  "Date" : "Mon, 29 Apr 2019 11:04:20 GMT"
  "vary" : "origin,accept-encoding"
  "Connection" : "keep-alive"
  "Content-Type" : "application/json; charset=utf-8"
  "cache-control" : "private, no-store, no-cache, must-revalidate, post-check=0,
    pre-check=0"
  "WWW-Authenticate" : "Bearer error="Expired token received for JSON Web Token
    validation""
  "content-encoding" : "gzip"
  "Transfer-Encoding" : "chunked"
  }
  
```

2:04:23.320 PM START RequestId: 21887be5-85d1-458c-b54a-b022679ae8a9 Version: \$LATEST

2:04:23.324 PM {'resource': '/new_post', 'path': '/new_post', 'httpMethod': 'POST', 'headers': {'Accept': '*/*', 'Accept-Encoding': 'gzip, deflate', 'Authorization': '5b39c732fbdc762d016b6ed', 'CloudFront-Forwarded-Proto': 'https', 'CloudFront-Is-Desktop-Viewer': 'true', 'CloudFront-Is-Mobile-Viewer': 'false', 'CloudFront-Is-SmartTV-Viewer': 'false', 'CloudFront-Is-Tablet-Viewer': 'false', 'CloudFront-Viewer-Country': 'US', 'content-type': 'application/json', 'Host': '8d4pi5ga91.execute-api.us-east-1.amazonaws.com', 'User-Agent': 'python-requests/2.21.0', 'Via': '1.1 936f33bed45438343f0ef2adff442815.cloudfront.net (CloudFront)', 'X-Amz-Cf-Id': 'CBFYvkFFJRAR5T1-hmSXeOE3NggKGYQfOpBD1sucwtx3wlfkGU2gwg==', 'X-Amzn-Trace-Id': 'Root=1-5cc6da37-fbb4e1686b513a8a3dbab690', 'X-Forwarded-For': '3.89.199.50, 70.132.33.144', 'X-Forwarded-Port': '443', 'X-Forwarded-Proto': 'https'}, 'multiValueHeaders': {'Accept': ['/*/*'], 'Accept-Encoding': ['gzip, deflate'], 'Authorization': ['5b39c732fbdc762d016b6ed'], 'CloudFront-Forwarded-Proto': ['https'], 'CloudFront-Is-Desktop-Viewer': ['true'], 'CloudFront-Is-Mobile-Viewer': ['false'], 'CloudFront-Is-SmartTV-Viewer': ['false'], 'CloudFront-Is-Tablet-Viewer': ['false'], 'CloudFront-Viewer-Country': ['US'], 'content-type': ['application/json'], 'Host': ['8d4pi5ga91.execute-api.us-east-1.amazonaws.com'], 'User-Agent': ['python-requests/2.21.0'], 'Via': ['1.1 936f33bed45438343f0ef2adff442815.cloudfront.net (CloudFront)'], 'X-Amz-Cf-Id': ['CBFYvkFFJRAR5T1-hmSXeOE3NggKGYQfOpBD1sucwtx3wlfkGU2gwg=='], 'X-Amzn-Trace-Id': ['Root=1-5cc6da37-fbb4e1686b513a8a3dbab690'], 'X-Forwarded-For': ['3.89.199.50, 70.132.33.144'], 'X-Forwarded-Port': ['443'], 'X-Forwarded-Proto': ['https']}, 'queryStringParameters': None, 'multiValueQueryStringParameters': None, 'pathParameters': None, 'stageVariables': None, 'requestContext': {'resourceId': 'kq4485', 'resourcePath': '/new_post', 'httpMethod': 'POST', 'extendedRequestId': 'Y5clpHYDIAMFmXA=', 'requestTime': '29/Apr/2019:11:04:23 +0000', 'path': '/prod/new_post', 'accountId': '147457102604', 'protocol': 'HTTP/1.1', 'stage': 'prod', 'domainPrefix': '8d4pi5ga91', 'requestTimeEpoch': 1556535863301, 'requestId': '8ba083ef-6a6e-11e9-ba64-d54b71087b81', 'identity': {'cognitoIdentityPoolId': None, 'accountId': None, 'cognitoIdentityId': None, 'caller': None, 'sourceIp': '3.89.199.50', 'accessKey': None, 'cognitoAuthenticationType': None, 'cognitoAuthenticationProvider': None, 'userArn': None, 'userAgent': 'python-requests/2.21.0', 'user': None}, 'domainName': '8d4pi5ga91.execute-api.us-east-1.amazonaws.com', 'apiId': '8d4pi5ga91'}, 'body': '{\n\t"title": "Netflix event",\n\t"post": "Netflix is excited to be heading back to Las Vegas for AWS re:Invent at the end of the month! Many Netflix engineers and recruiters will be in attendance, and were looking forward to meeting and reconnecting with cloud enthusiasts and Netflix OSS users. Were posting the schedule of Netflix talks here to make it a bit easier to find our speakers at re:Invent. Well also have a booth on the expo floor, so please stop by and say hello! At Netflix, we make explicit tradeoffs to balance our four key focus domains of innovation, reliability, security, and efficiency to ensure our customers, shareholders, and internal engineering stakeholders are happy. In this talk, learn the strategies behind each of our focus domains to optimize for one without detracting from another.",\n\t"validate": true,\n\t"error": false\n}', 'isBase64Encoded': False}

2:04:23.324 PM Validate=True

2:04:23.324 PM Got auth key

2:04:23.324 PM before req

2:04:23.705 PM {'statusCode': 401, 'error': 'Unauthorized', 'message': 'Expired token received for JSON Web Token validation', 'attributes': {'error': 'Expired token received for JSON Web Token validation'}}

2:04:23.705 PM Sending to SNS: N/A

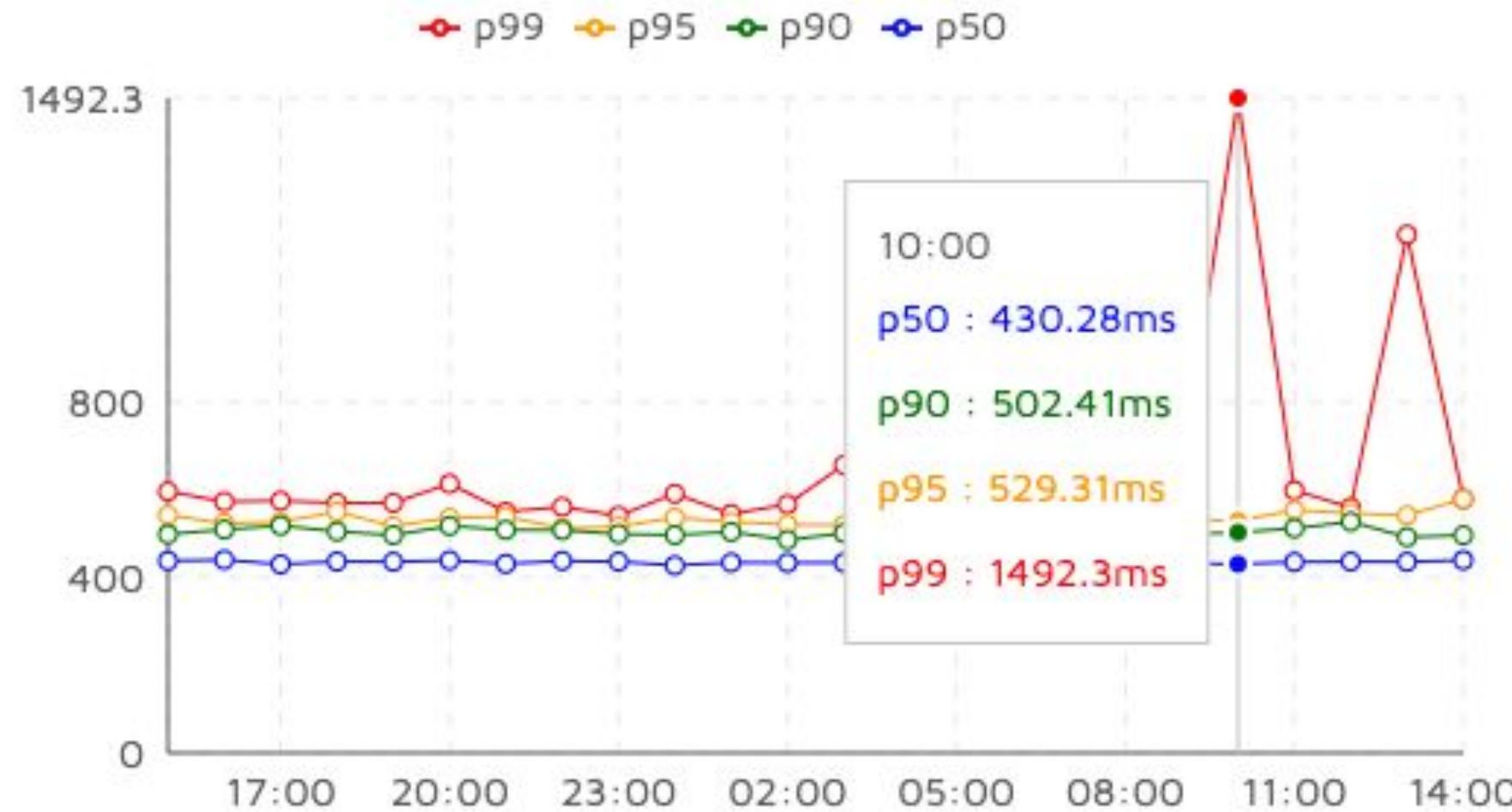
2:04:23.819 PM END RequestId: 21887be5-85d1-458c-b54a-b022679ae8a9

2:04:23.819 PM REPORT RequestId: 21887be5-85d1-458c-b54a-b022679ae8a9 Duration: 495.90 ms Billed Duration: 500 ms Memory Size: 1024 MB Max Memory Used: 81 MB

Scenario #3: Looking at anomalies

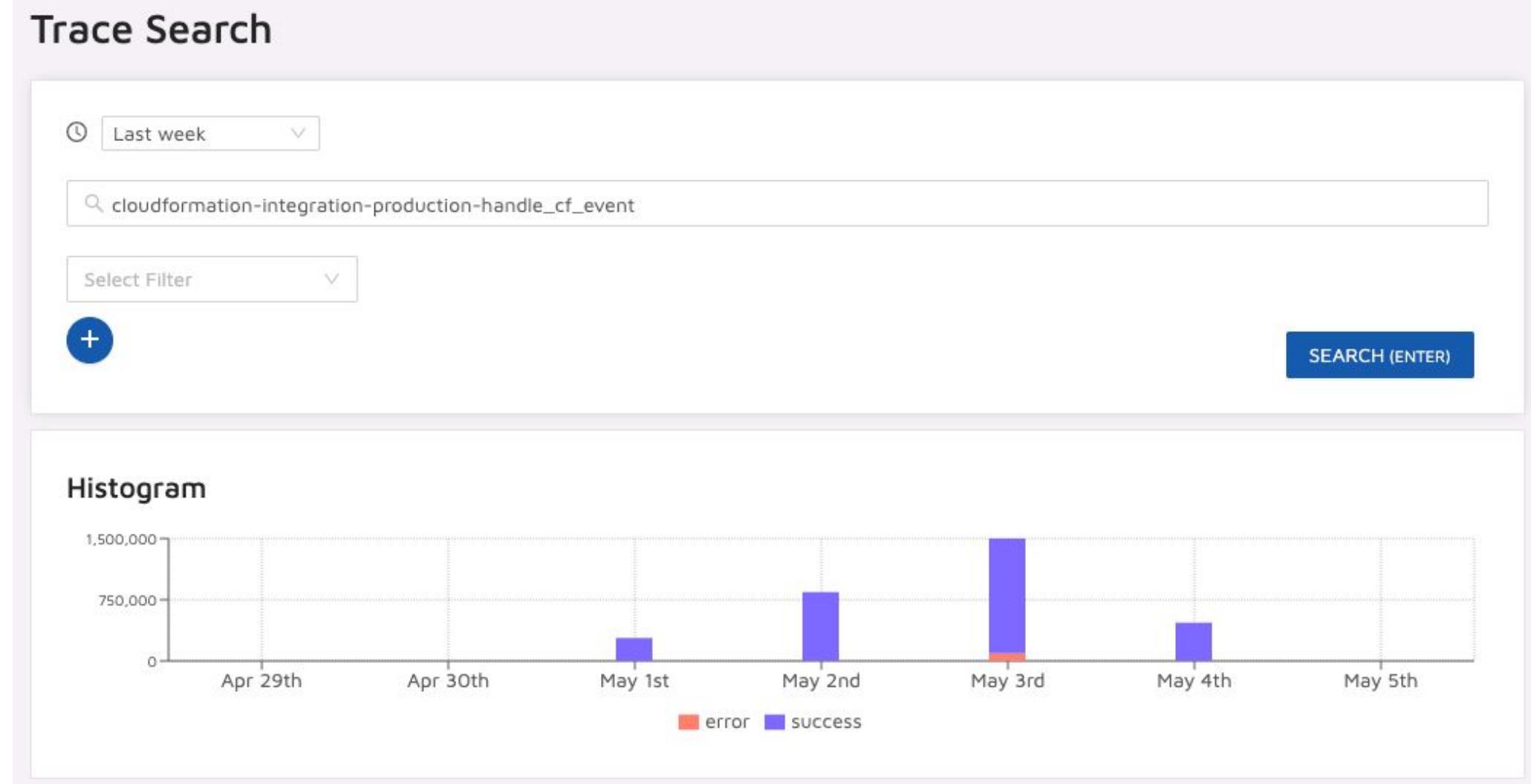
#4

Percentiles



#5

Histogram – spikes and errors

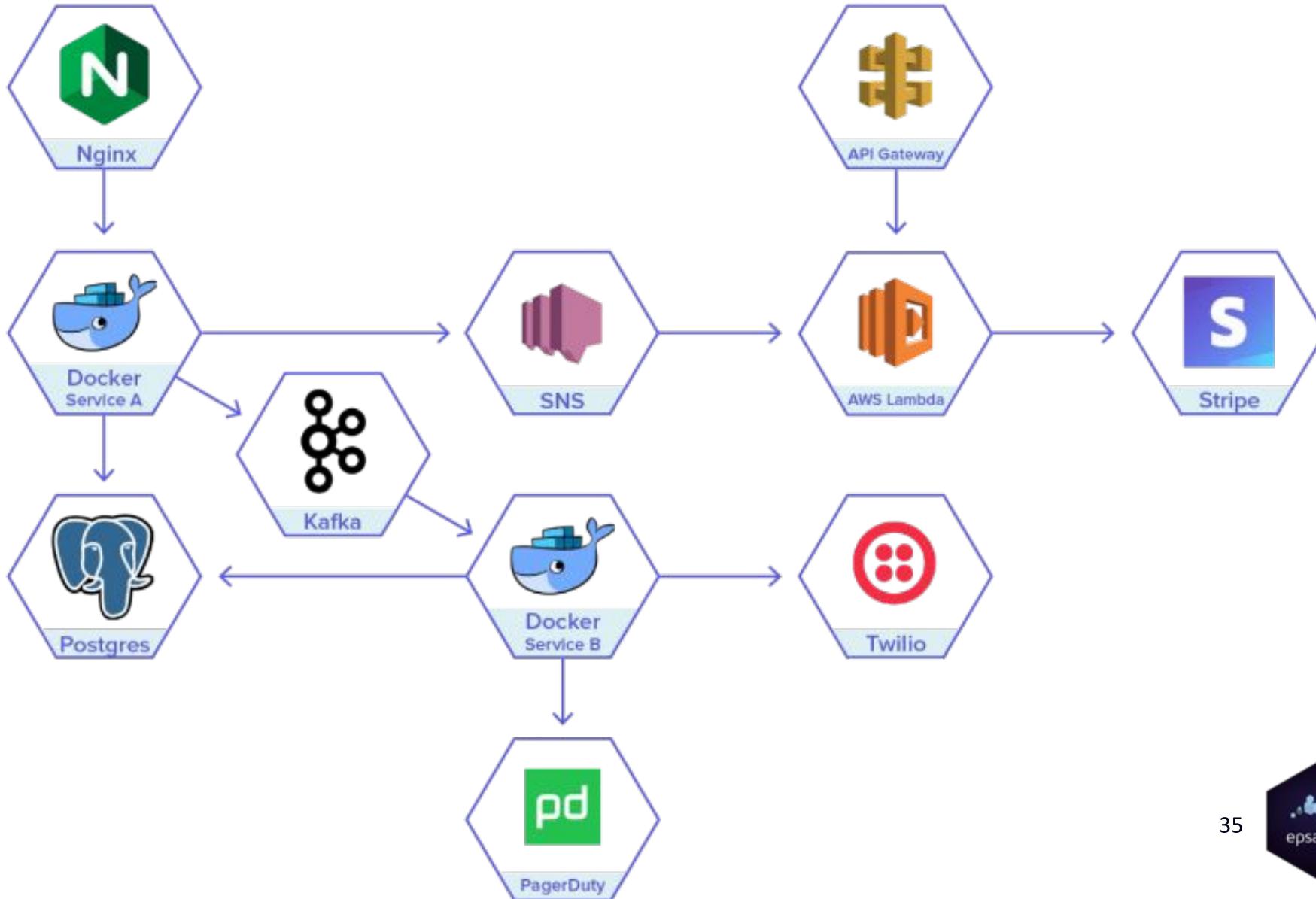


Visualization in distributed applications

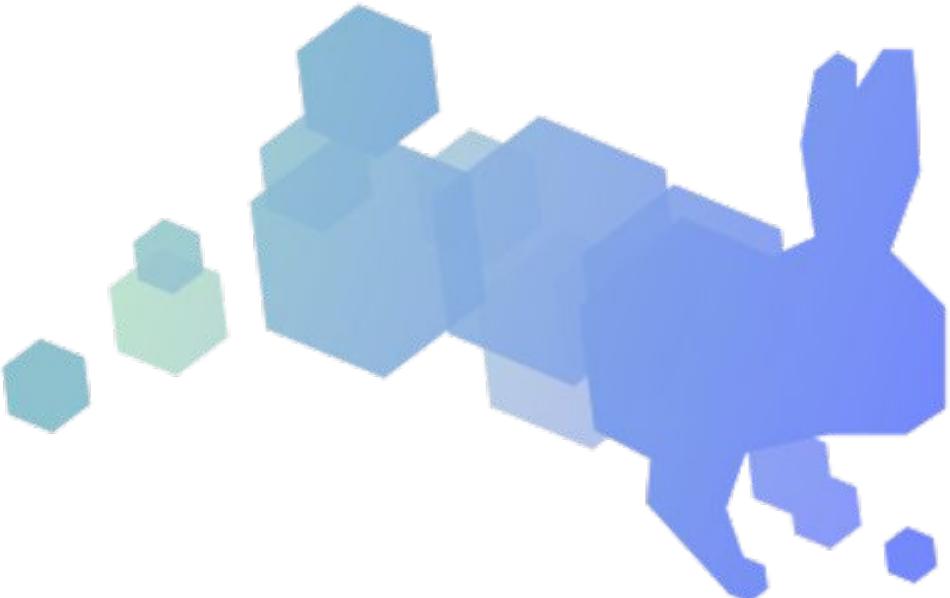


- Distributed applications bring different challenges
- Visualizing data is crucial for:
 - Keep track of the architecture
 - Detect performance issues
 - Troubleshoot “stories” and not logs
 - Detect anomalies

“A picture is worth a thousand ~~words~~ logs” Ran R.



Epsagon – monitoring and troubleshooting for distributed applications



- Automatically instruments your code
- Takes care to match distributed traces
- Visualizing data



Thank you!

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