Turning Synthetic Traces into Gold: Scalable Monitoring for Critical User Journeys

Sudeep Kumar
June, 2025

Principal Engineer, Salesforce

Monitoring Cloud

Monitoring at scale

10+
Languages/OS

Java, Go, Python, Ruby, NodeJS, C++, PHP
Windows, Linux

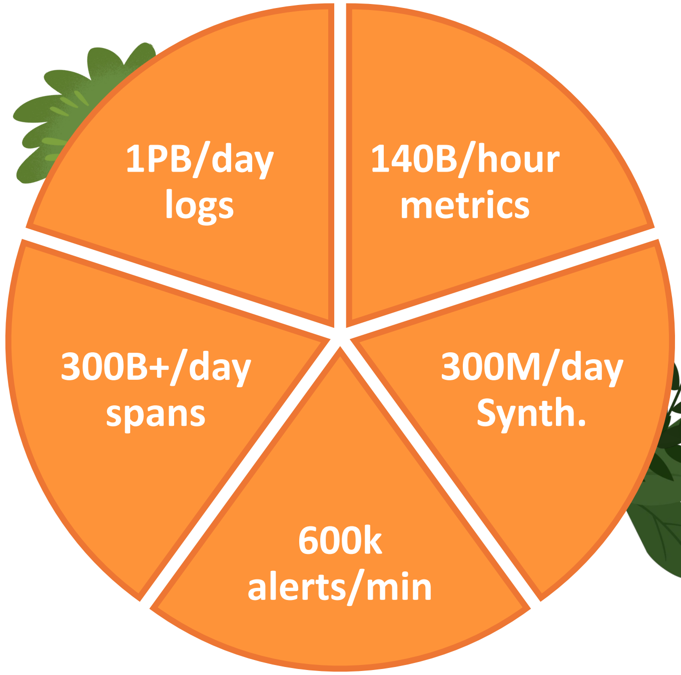
13k+ Developers

2k+ Teams

50+ Data Centers

1M+ Hosts/ Containers

5k+ Services



Critical User Journeys (CUJs)

“Hunting Down Hero Flows! 🕵️ 🚀 ”

- ➢ Emulate an end user’s journey (High value request flows)
- ➢ Often customer facing & business critical experiences
- ➢ A single user action involved in a CUJ often traverses many services
- ➢ Monitoring to ensure availability & performance for key transaction flows

Distributed Tracing

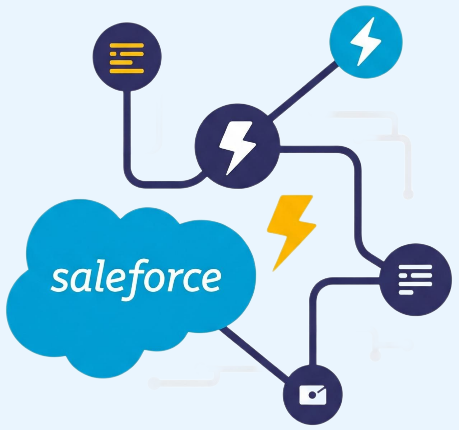
CUJs with Distributed Tracing

- ➢ Which services are involved in critical path?
- ➢ Tracking health of CUJ transactions
- ➢ Discover unwanted or unsafe access patterns
- ➢ Understand performance bottlenecks
- ➢ Reduce TTD/TTR

Instrumenting Applications – one span at a time! 👣

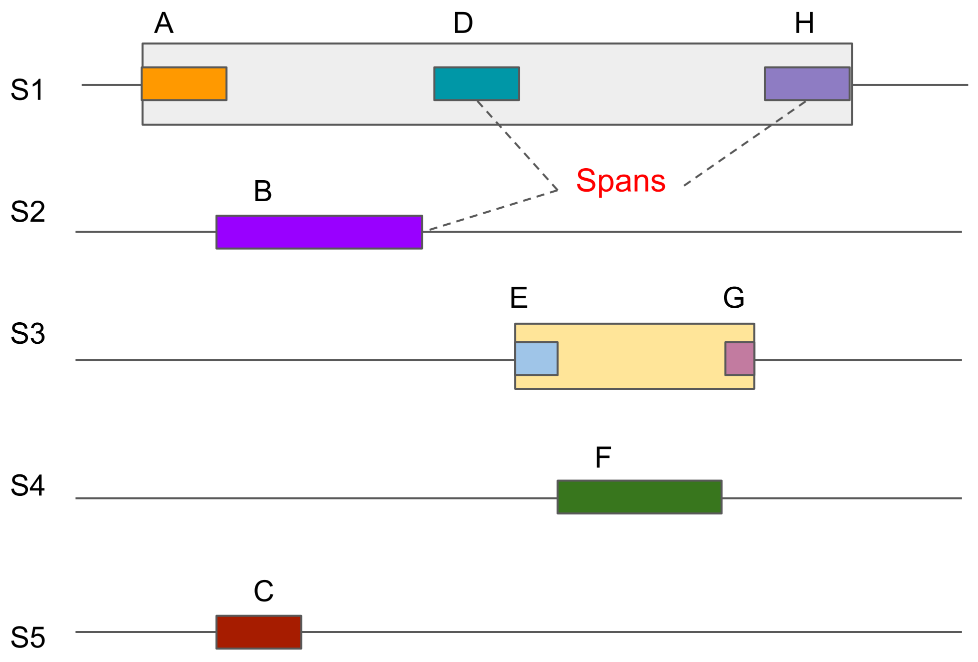
Tracer Platform

- Provides Distributed tracing for all Salesforce services
- Centralized collection of traces
- Trace Telemetry Signal Sources
  - APM agents
  - Custom trace instrumentation
  - Managed frameworks
  - Service Mesh infra for k8s workloads
  - Integration Tests
- Some numbers
  - ~300 Mill spans per min
  - ~10 million unique traces reported per min

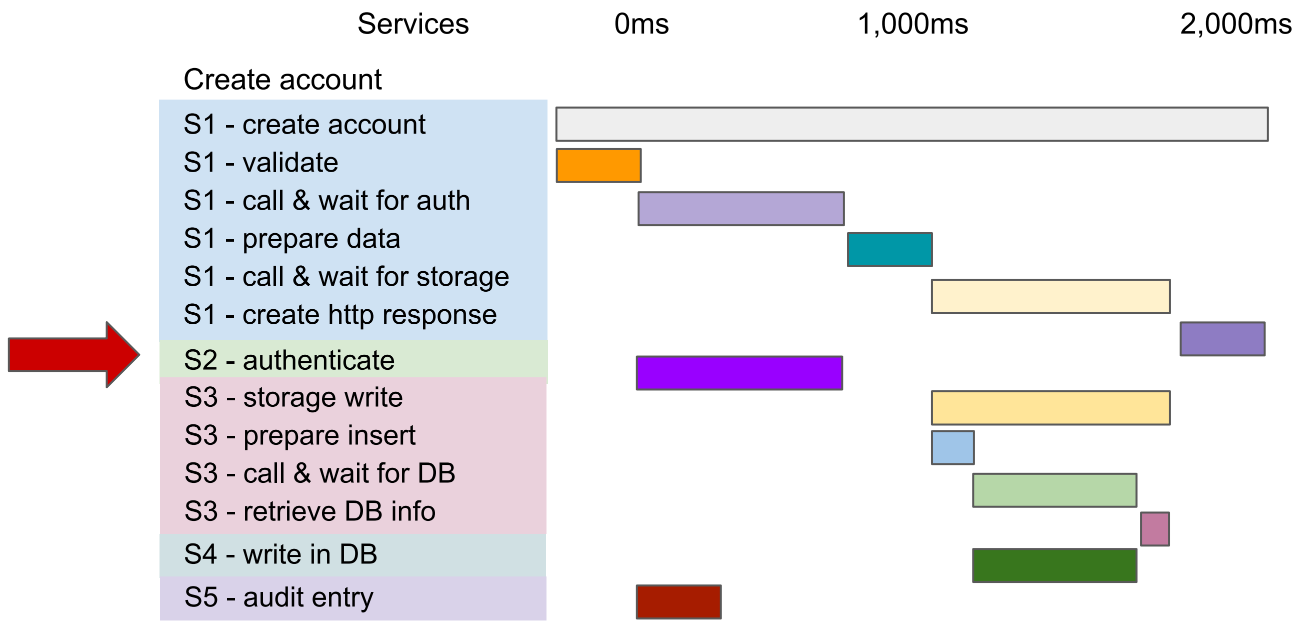


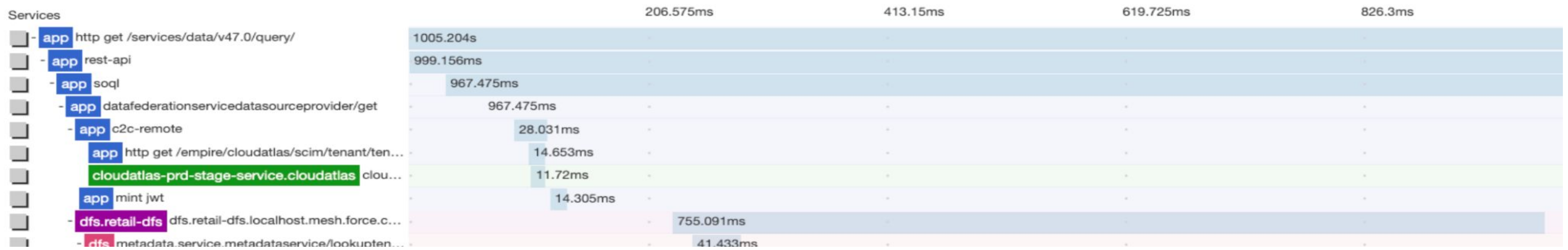
Distributed Tracing - Semantics

Sample Sequence Trace Flow - Create account



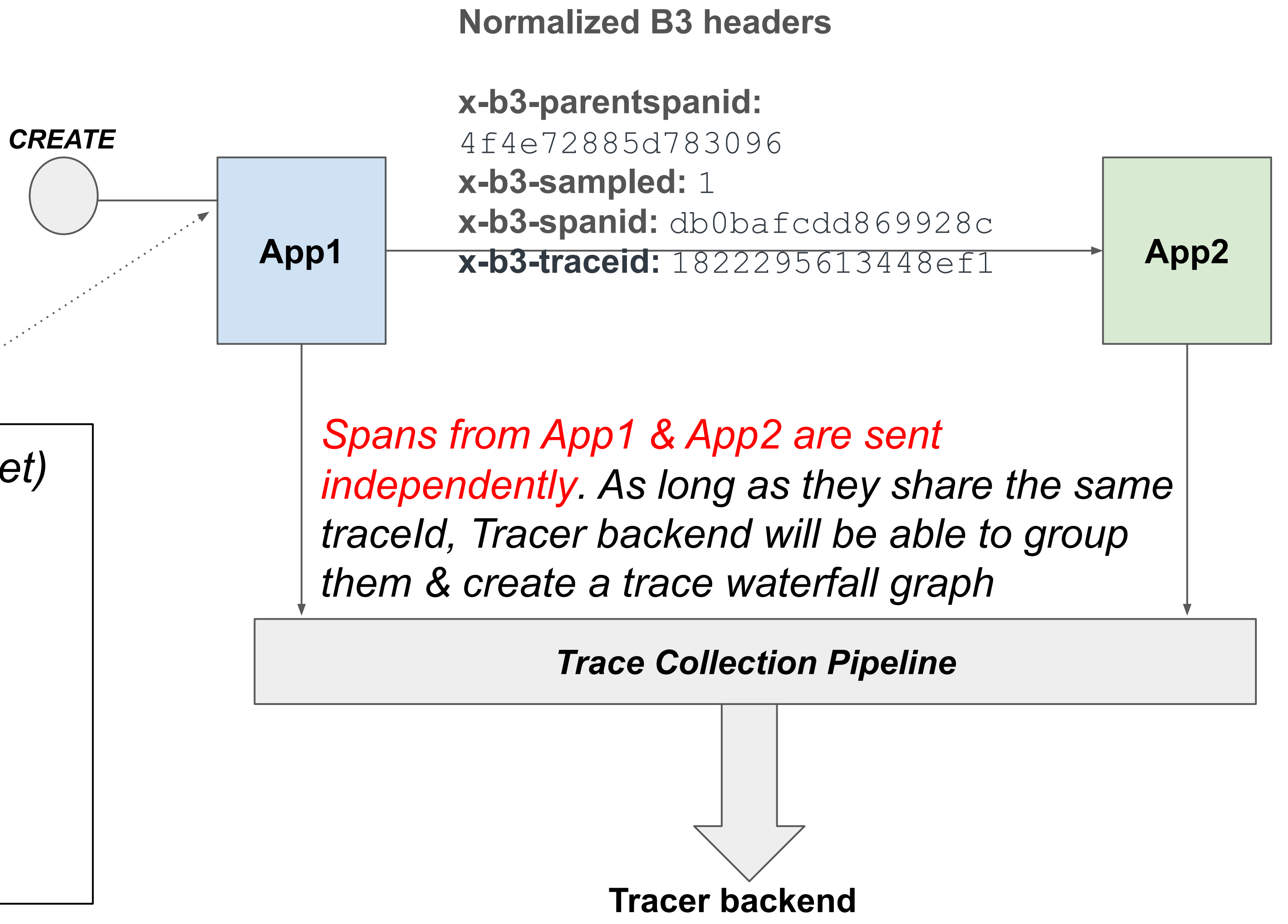
Tracer waterfall graph representation





```
Services                                                    206.575ms     413.15ms     619.725ms     826.3ms
- app http get /services/data/v47.0/query/                  1005.204s
  - app rest-api                                            999.156ms
    - app soql                                                 967.475ms
      - app datafederationservicedatasourceprovider/get           967.475ms
        - app c2c-remote                                              28.031ms
            app http get /empire/cloudatlas/scim/tenant/ten...          14.653ms
            cloudatlas-prd-stage-service.cloudatlas clou...             11.72ms
          app mint jwt                                                    14.305ms
        - dfs.retail-dfs dfs.retail-dfs.localhost.mesh.force.c...                  755.091ms
          - dfs metadata.service.metadataservice/lookupten...                        41.433ms
```

Context Propagation Between Services

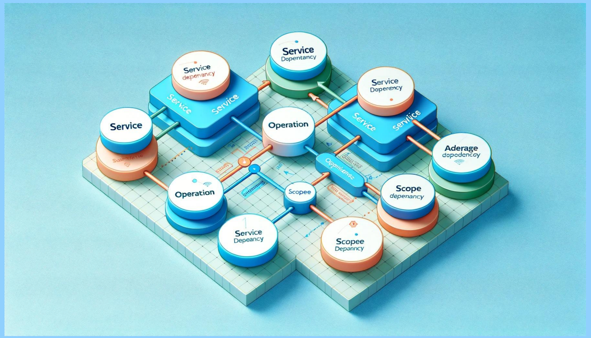


Normalized B3 headers
x-b3-parentspanid: 4f4e72885d783096
x-b3-sampled: 1
x-b3-spanid: db0bafcdd869928c
x-b3-traceid: 1822295613448ef1
CREATE
App1
App2
Spans from App1 & App2 are sent independently. As long as they share the same traceId, Tracer backend will be able to group them & create a trace waterfall graph
Trace Collection Pipeline
Tracer backend

Creator of root span (no context yet) sets the sampling bit based on sampling policy

Decision to sample will be propagated and the downstream system will comply with the initial decision.

Enabling CUJs with Distributed Tracing



Synthetic Tests for outside-in visibility

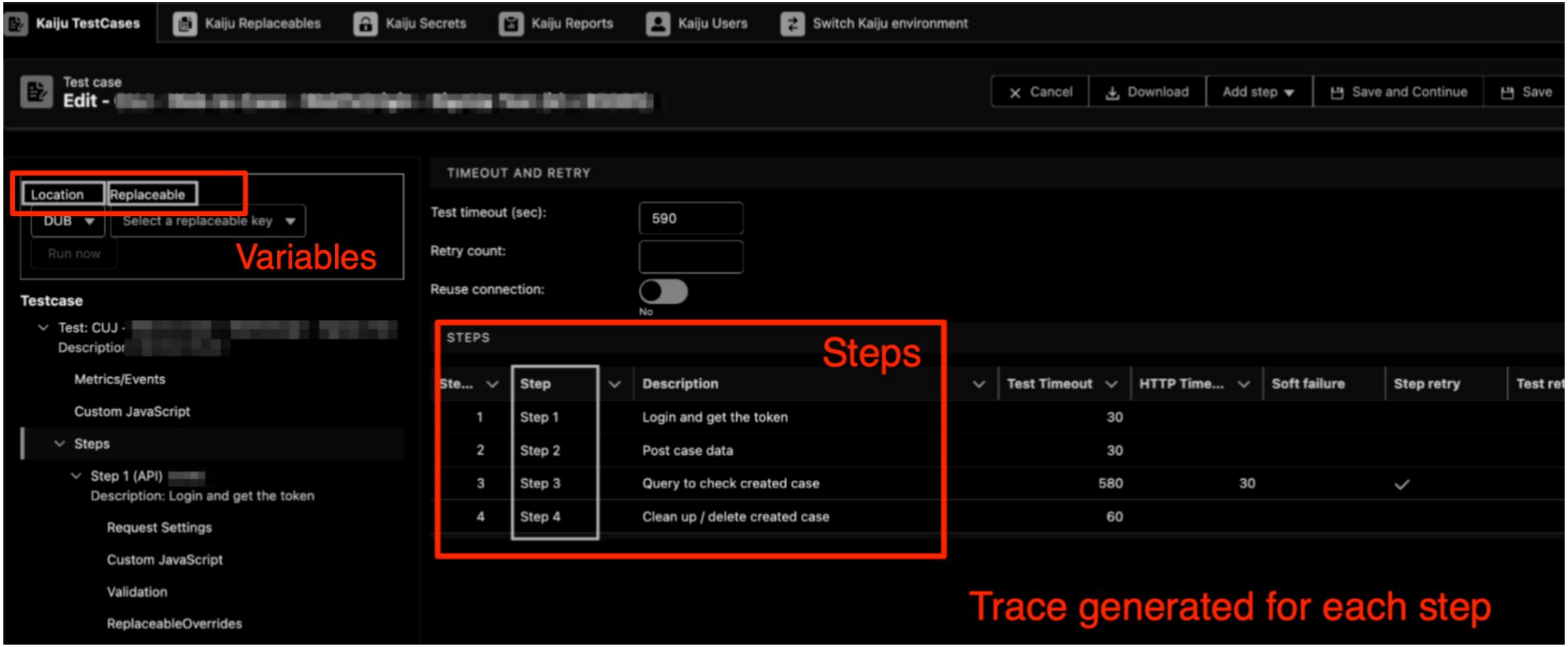
Trace Synthetics

Critical User Journey (**CUJ**), **API** tests, **Real browser** tests, multi steps

Self-service synthetic testing framework

- Deep "outside-in" view providing backend visibility thanks to traces
  - Every Synthetic with 100% sampling
- Real Browser monitoring: Multiple steps using a real browser
- API monitoring
- DNS monitoring
- Ad-hoc feature to trigger test now
- Ability to templatize test to run on all service instances
- Performance and availability from user perspective

Enable Synthetic Test with Trace



Test case
Edit - [redacted]

Testcase
- Test: CUJ - [redacted]
  Description [redacted]
  - Metrics/Events
  - Custom JavaScript
  - Steps
    - Step 1 (API) [redacted]
      Description: Login and get the token
      - Request Settings
      - Custom JavaScript
      - Validation
      - ReplaceableOverrides

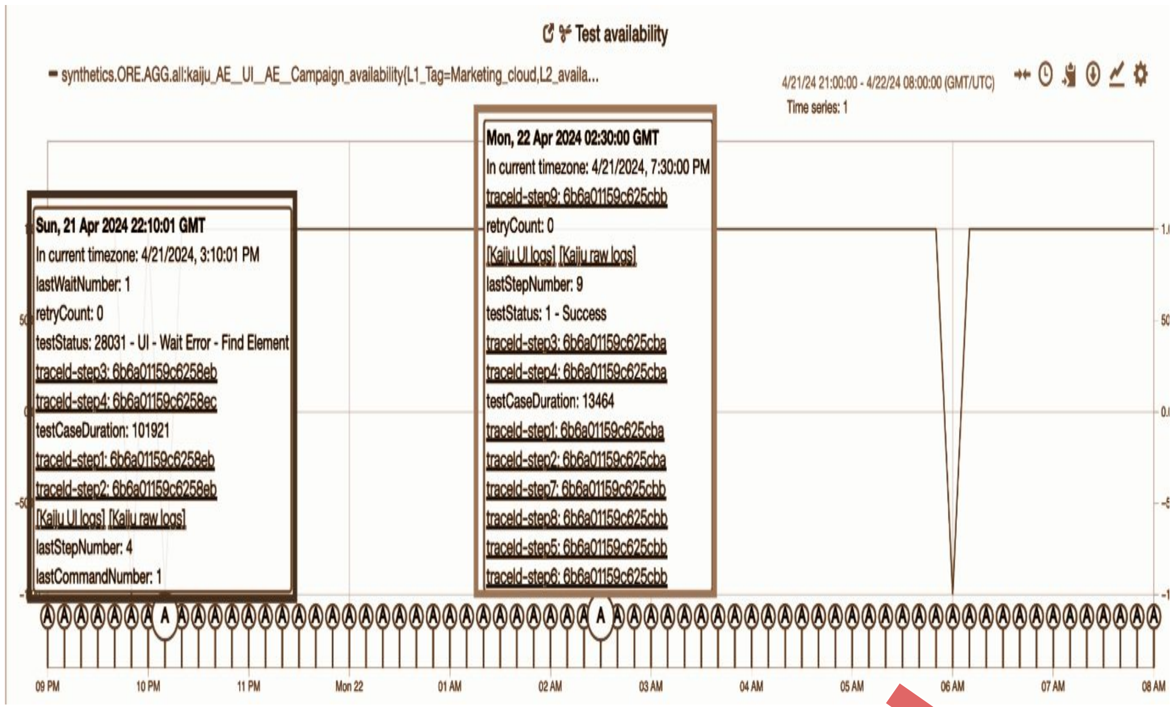
TIMEOUT AND RETRY

Test timeout (sec): 590
Retry count:
Reuse connection: No

STEPS

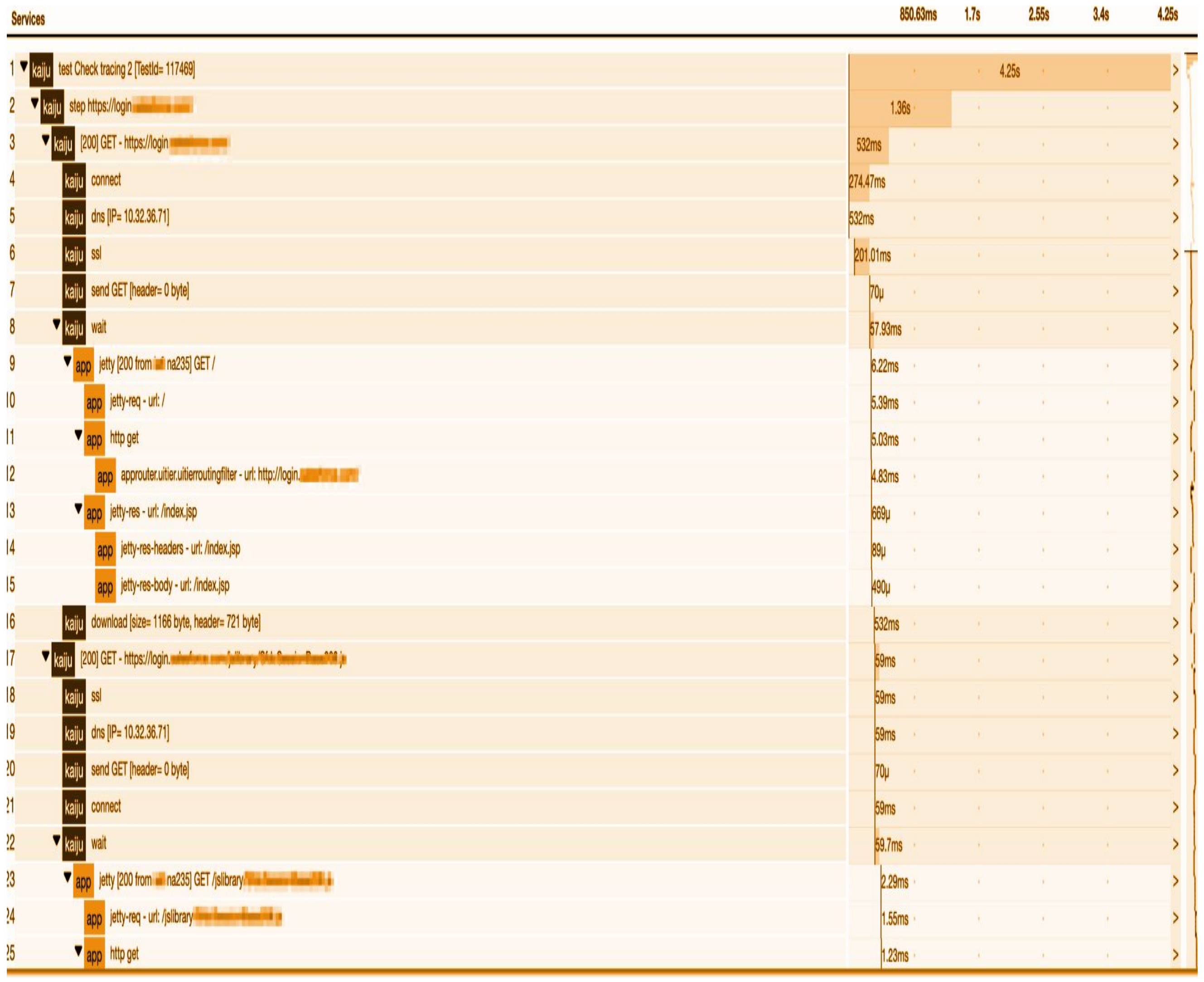
Ste...	Step	Description	Test Timeout	HTTP Time...	Soft failure	Step retry	Test ret
1	Step 1	Login and get the token	30				
2	Step 2	Post case data	30				
3	Step 3	Query to check created case	580	30		✓	
4	Step 4	Clean up / delete created case	60				

Synthetic Test Execution with Trace


Test availability
synthetics.ORE.AGG.all:kaiju_AE__UI__AE__Campaign_availability{L1_Tag=Marketing_cloud,L2_availa...
4/21/24 21:00:00 - 4/22/24 08:00:00 (GMT/UTC)
Time series: 1
09 PM
10 PM
11 PM
Mon 22
01 AM
02 AM
03 AM
04 AM
05 AM
06 AM
07 AM
08 AM

Sun, 21 Apr 2024 22:10:01 GMT
In current timezone: 4/21/2024, 3:10:01 PM
lastWaitNumber: 1
retryCount: 0
testStatus: 28031 - UI - Wait Error - Find Element
traceld-step3: 6b6a01159c6258eb
traceld-step4: 6b6a01159c6258ec
testCaseDuration: 101921
traceld-step1: 6b6a01159c6258eb
traceld-step2: 6b6a01159c6258eb
[Kaiju UI logs] [Kaiju raw logs]
lastStepNumber: 4
lastCommandNumber: 1

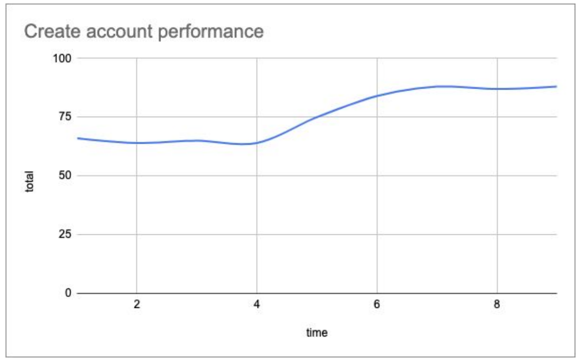
Mon, 22 Apr 2024 02:30:00 GMT
In current timezone: 4/21/2024, 7:30:00 PM
traceld-step9: 6b6a01159c625cbb
retryCount: 0
[Kaiju UI logs] [Kaiju raw logs]
lastStepNumber: 9
testStatus: 1 - Success
traceld-step3: 6b6a01159c625cba
traceld-step4: 6b6a01159c625cba
testCaseDuration: 13464
traceld-step1: 6b6a01159c625cba
traceld-step2: 6b6a01159c625cba
traceld-step7: 6b6a01159c625cbb
traceld-step8: 6b6a01159c625cbb
traceld-step5: 6b6a01159c625cbb
traceld-step6: 6b6a01159c625cbb

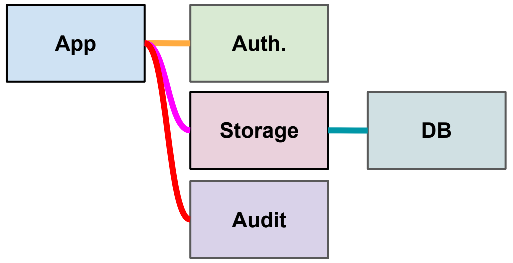


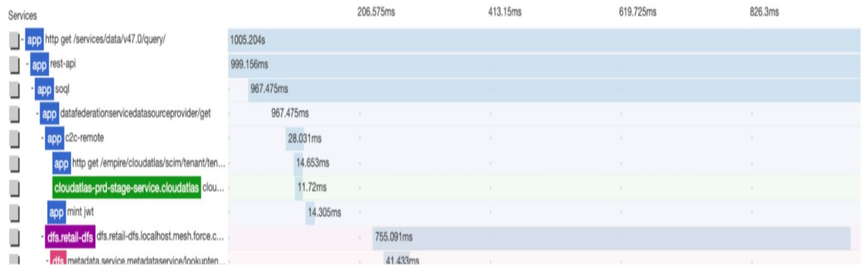
```
Services                                                              850.63ms  1.7s  2.55s  3.4s  4.25s
1  ▼ kaiju test Check tracing 2 [TestId= 117469]                      4.25s
2    ▼ kaiju step https://login[redacted]                             1.36s
3      ▼ kaiju [200] GET - https://login[redacted]                    532ms
4          kaiju connect                                              274.47ms
5          kaiju dns [IP= 10.32.36.71]                                532ms
6          kaiju ssl                                                  201.01ms
7          kaiju send GET [header= 0 byte]                            70µ
8        ▼ kaiju wait                                                 57.93ms
9          ▼ app jetty [200 from [redacted] na235] GET /              6.22ms
10             app jetty-req - url: /                                 5.39ms
11           ▼ app http get                                           5.03ms
12               app approuter.uitier.uitierroutingfilter - url: http://login.[redacted]   4.83ms
13           ▼ app jetty-res - url: /index.jsp                        669µ
14               app jetty-res-headers - url: /index.jsp              89µ
15               app jetty-res-body - url: /index.jsp                 490µ
16         kaiju download [size= 1166 byte, header= 721 byte]         532ms
17     ▼ kaiju [200] GET - https://login.[redacted]                   59ms
18         kaiju ssl                                                  59ms
19         kaiju dns [IP= 10.32.36.71]                                59ms
20         kaiju send GET [header= 0 byte]                            70µ
21         kaiju connect                                              59ms
22       ▼ kaiju wait                                                 59.7ms
23         ▼ app jetty [200 from [redacted] na235] GET /jslibrary[redacted]   2.29ms
24             app jetty-req - url: /jslibrary[redacted]              1.55ms
25           ▼ app http get                                           1.23ms
```

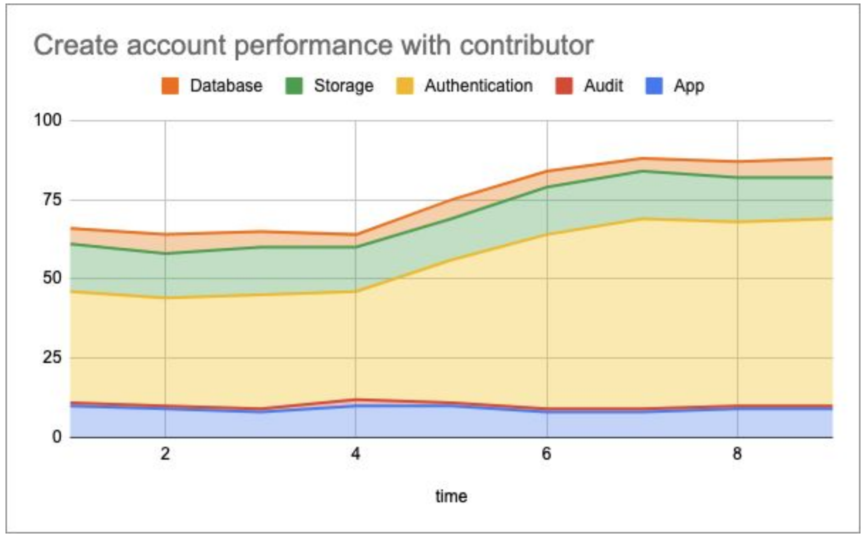
Transaction Contributors

Understand the performance contribution of all services for a specific transaction



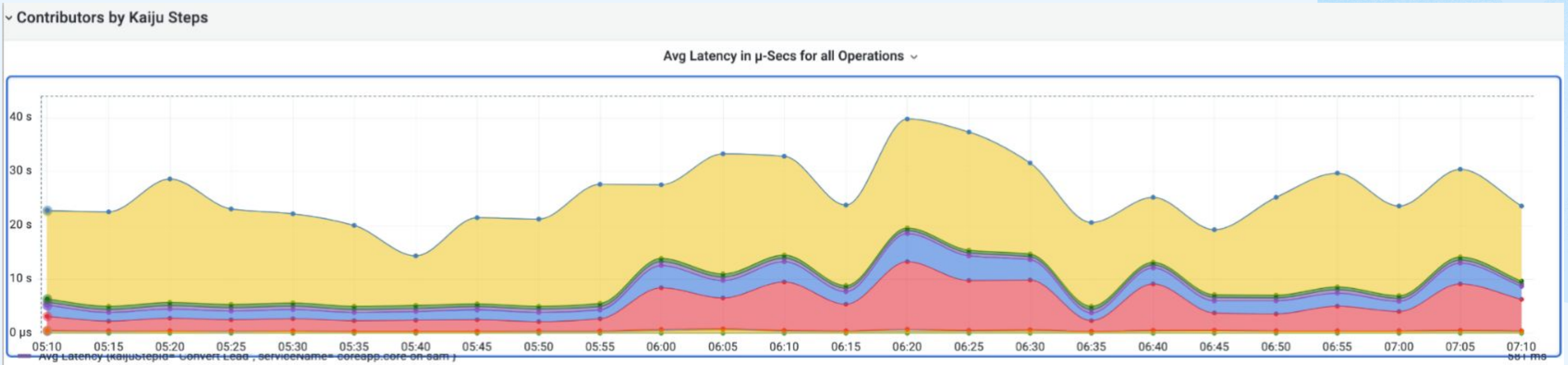



```
Services                                          206.575ms    413.15ms    619.725ms    826.3ms
- app http get /services/data/v47.0/query/        1005.204s
 - app rest-api                                   999.156ms
  - app soql                                      967.475ms
   - app datafederationservicedatasourceprovider/get   967.475ms
    - app c2c-remote                              28.031ms
      app http get /empire/cloudatlas/scim/tenant/ten...   14.653ms
      cloudatlas-prd-stage-service.cloudatlas clou...      11.72ms
     app mint jwt                                 14.305ms
    - dfs.retail-dfs dfs.retail-dfs.localhost.mesh.force.c...   755.091ms
     - dfs metadata.service.metadataservice/lookupten...        41.433ms
```



Analyze a group of traces of the same transaction to depict a time-series view the average time spent in each service for the transaction

Which service led to perf degradation? Contributors



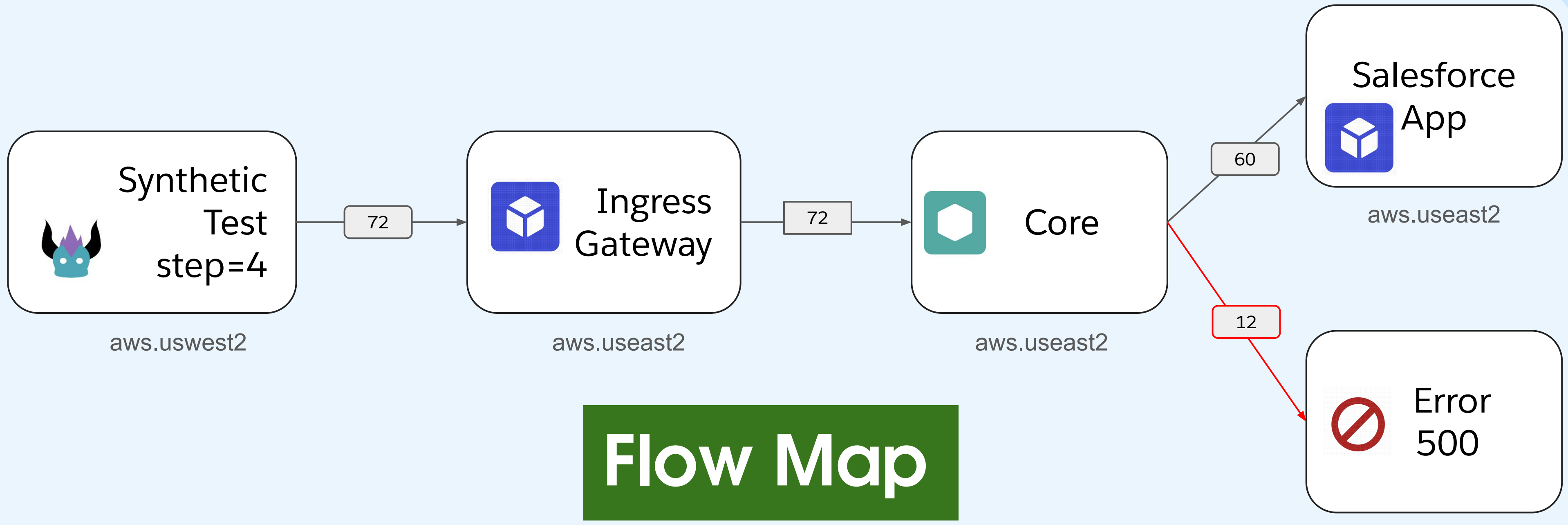
Avg Latency {kaijuStepId="Convert Lead", serviceName="coreapp.core-on-sam"}	581 ms
🟨 Avg Latency {kaijuStepId="Convert Lead", serviceName="coreApp.Infra.C[redacted]PI."}	353 ms
🟦 Avg Latency {kaijuStepId="Convert Lead", serviceName="coreApp.Infra[redacted]."}	113 ms
🟧 Avg Latency {kaijuStepId="Convert Lead", serviceName="coreApp.Infra.D[redacted]."}	33.5 ms
🟦 Avg Latency {kaijuStepId="Convert Lead", serviceName="kaiju.istio-ingressgateway.sfproxy"}	9.37 ms
🟪 Avg Latency {kaijuStepId="Convert Lead", serviceName="coreApp.customSchema.[redacted]n"}	7.09 ms
🟩 Avg Latency {kaijuStepId="Convert Lead", serviceName="coreApp.AccessControlServices.[redacted]"}	641 μs

Contributors show how much each underlying service in a Synthetic step contributes to overall response time on the step

- The visual helps spot the service(s) causing performance degradation of a Kaiju step
- Draws the insight on behalf of the user. Equivalent to
  - opening all traces for that step in a period of two hours (~144 traces)
  - aggregating total duration of each service across all traces
  - comparing the duration to a baseline performance
  - concluding the faulty service causing perf degradation

Flow Maps

- Reduce clicks needed to identify service causing test failures or performance issues by aggregated traces



On-Demand Tracing

- ➢ User specific on-demand tracing
- ➢ Long term tracing
- ➢ Instance based tracing

thank you