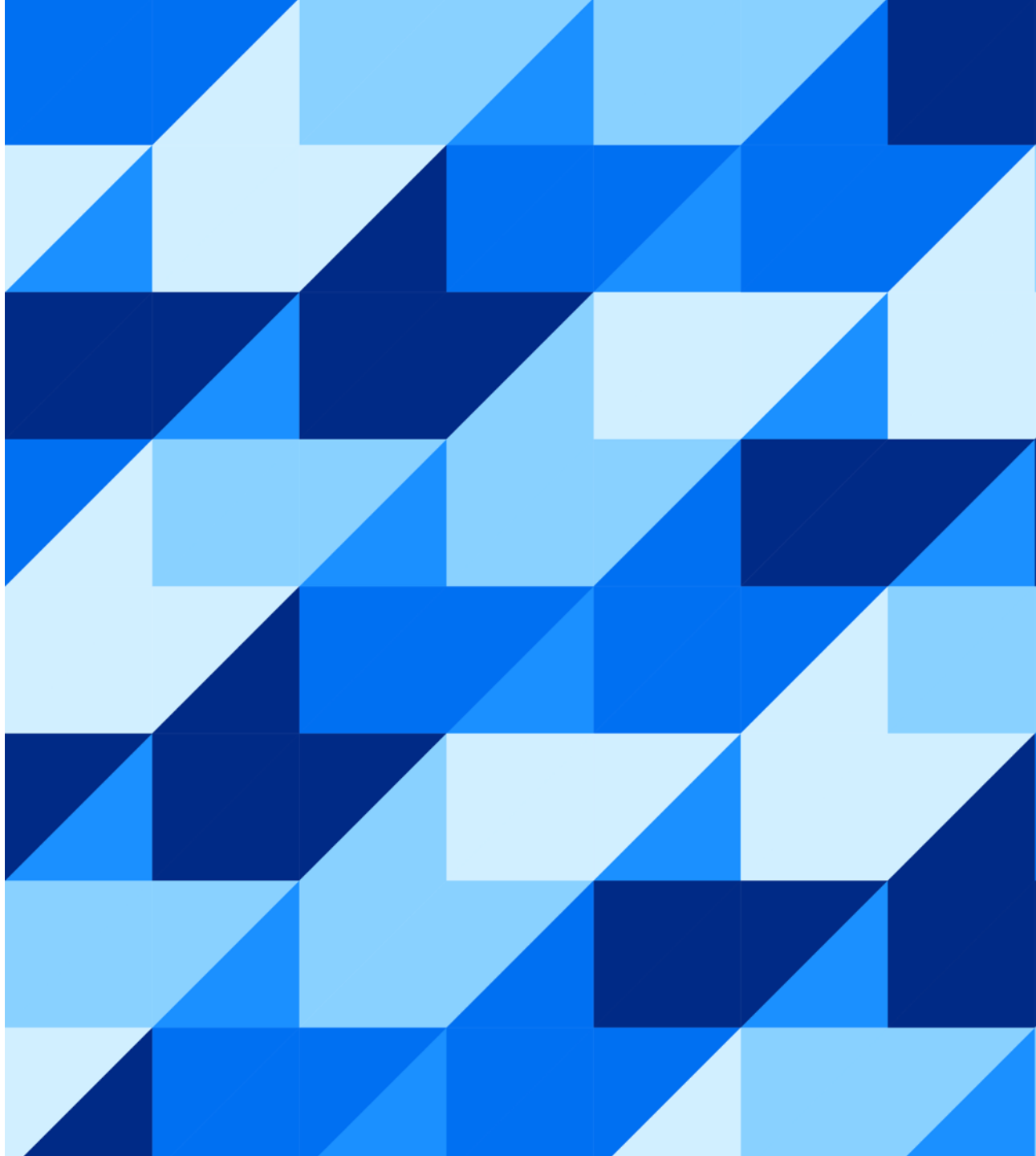

How SAP analyzes OpenTelemetry signals using Data Prepper

Jannik Brand, SAP
David Venable, AWS

May 07, 2024

Public

About us

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Software Developer, SAP

David Venable

Senior Software Development Engineer, AWS

Agenda

Introduction: The Observability Solution SAP Cloud Logging

Motivation to support OpenTelemetry with OpenSearch Data Prepper

Data Prepper - General Overview

How SAP Cloud Logging utilizes Data Prepper

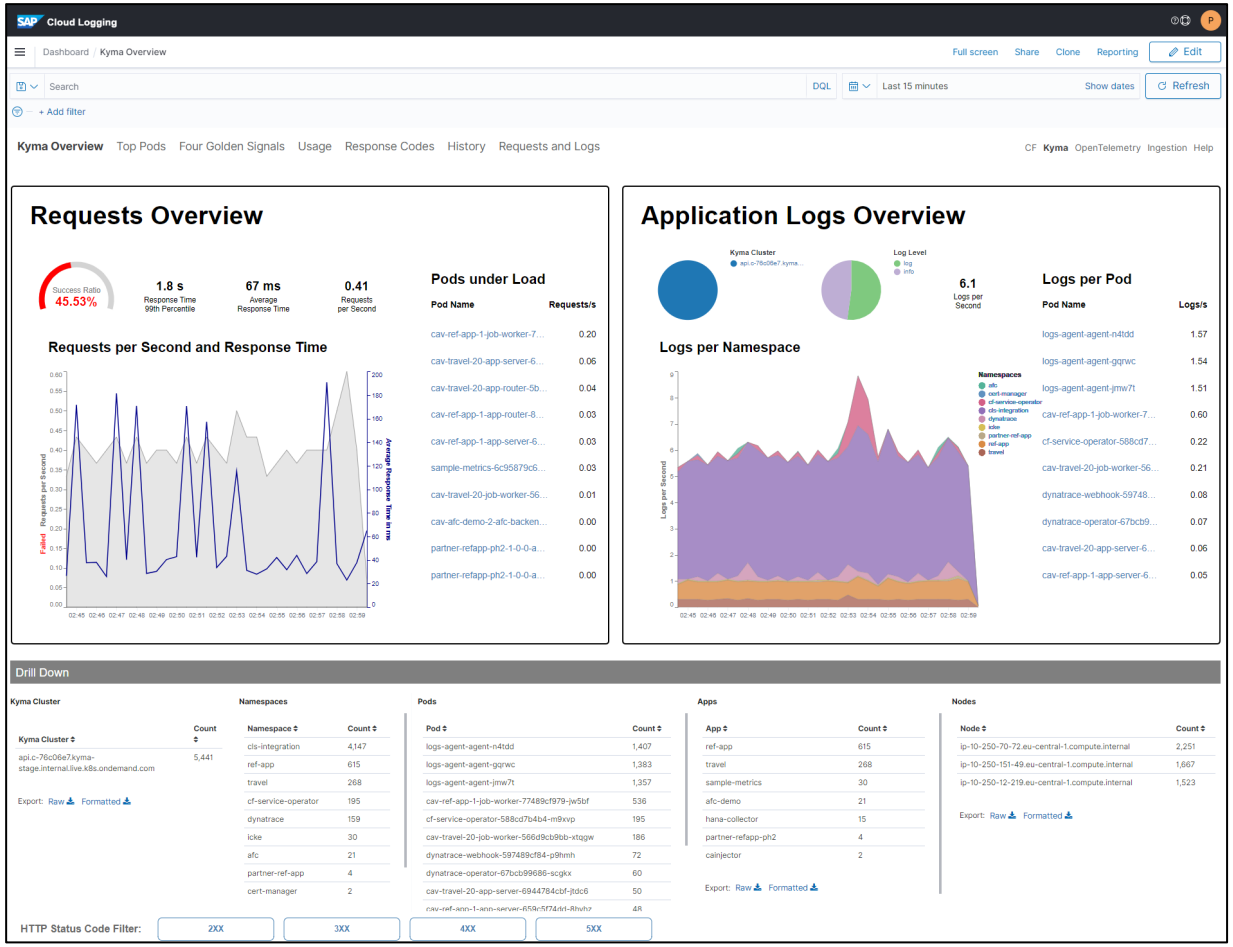
Collaboration

The Observability Solution - SAP Cloud Logging

- Store/visualize/analyze application logs, metrics and traces from different runtime environments (such as SAP BTP Cloud Foundry, Kyma, Kubernetes)

- Based on OpenSearch
- Instance-based service running on Kubernetes
- More general information about SAP Cloud Logging presented in Keynote

- >7400 internal customer instances
- Generally Available since Dec 2023



OpenTelemetry - Motivation

- Collection of APIs, SDKs, tools to instrument/generate/collect and export telemetry data

- SAP Cloud Logging's perspective:
  - Support logs, metrics and traces
  - CNCF standard for Observability

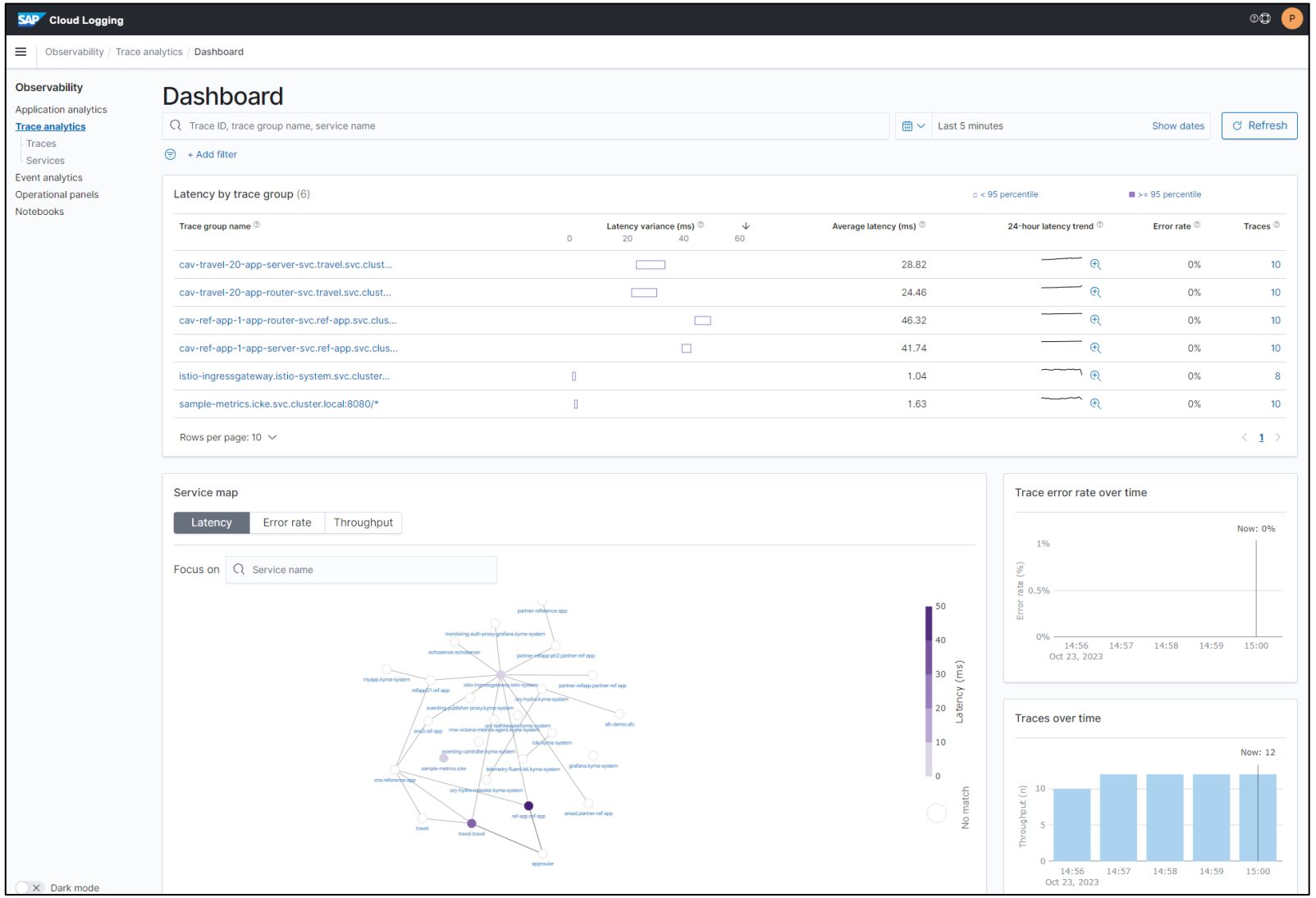
- Customer perspective:
  - Easy code instrumentation
  - Open-source and vendor-neutral

How Data Prepper comes into play

- Data collector managed by OpenSearch project
- Supports OTel protocol

- OpenSearch requires the OpenTelemetry documents in a specific format
- Data Prepper maps incoming OTel data into the expected format

- => Allows to ingest OTel logs, metrics and traces into OpenSearch



OpenSearch Trace Analytics Plugin

Data Prepper – General Overview

Data Prepper in the OpenSearch platform

Data Prepper Overview

Community-driven, open-source

Distributed trace, log, metric data

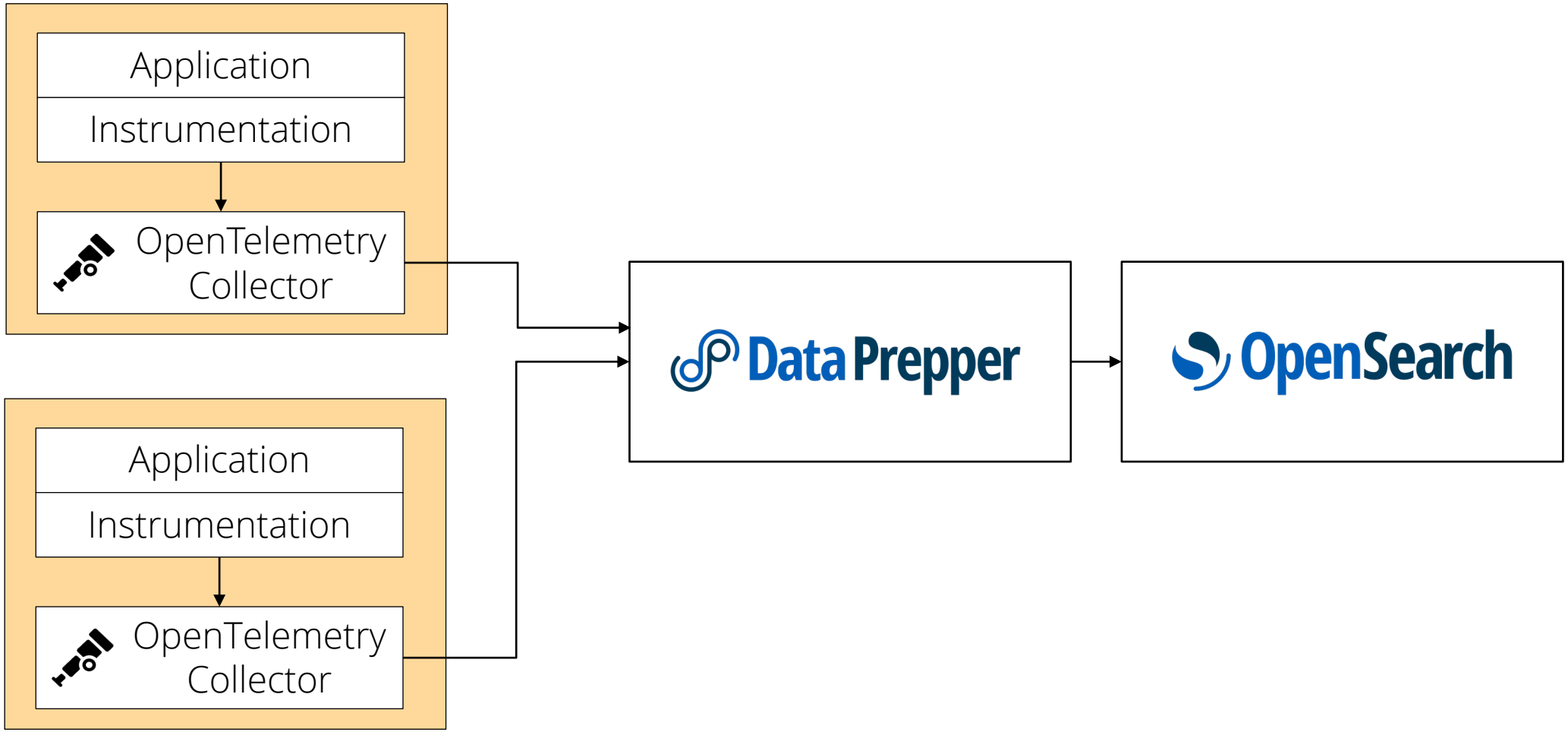
Filter, enrich, transform, normalize data

Buffering of data

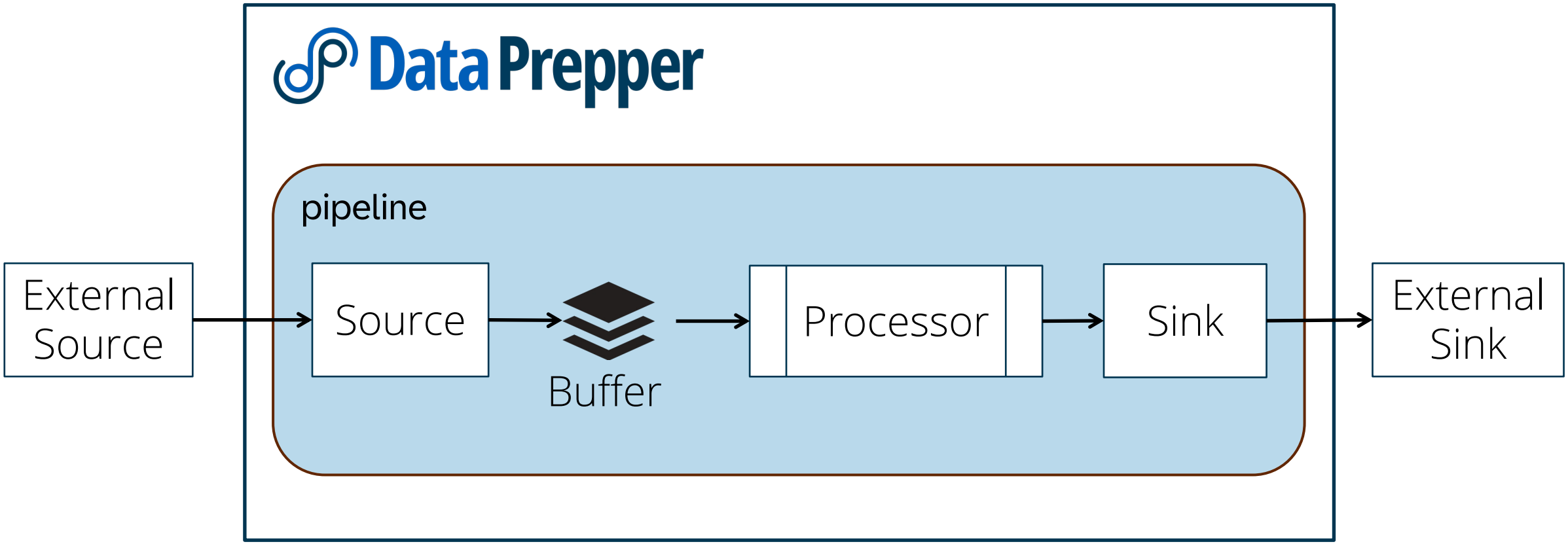
Stateful processing

Routing of data

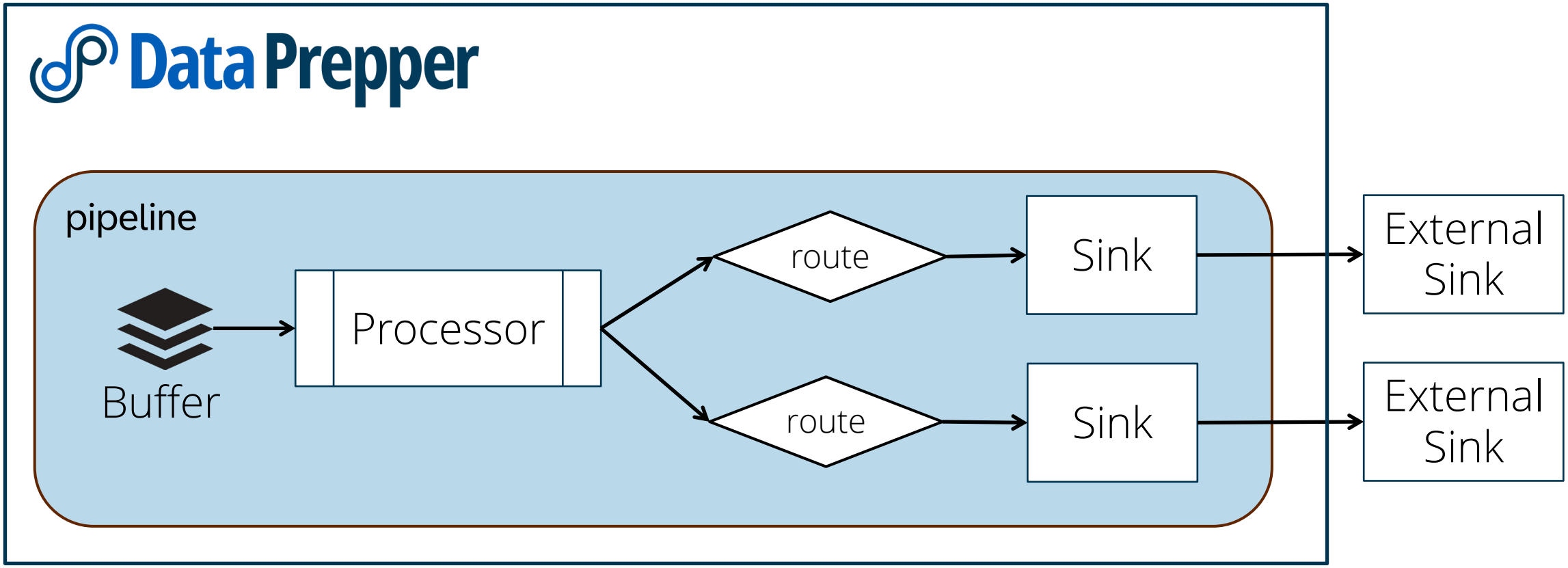
OpenTelemetry Architecture



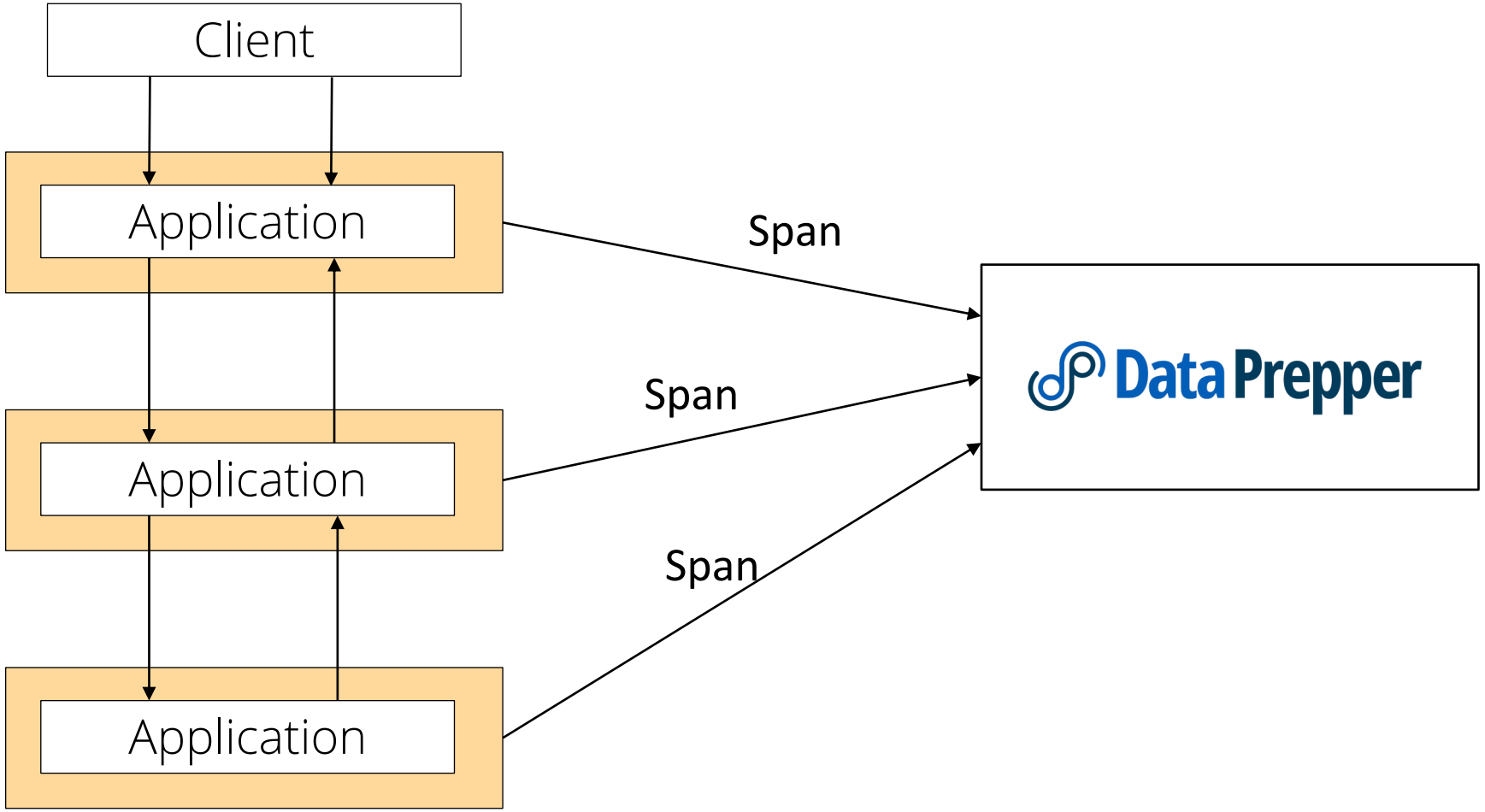
Pipelines


Data Prepper
pipeline
External Source
Source
Buffer
Processor
Sink
External Sink

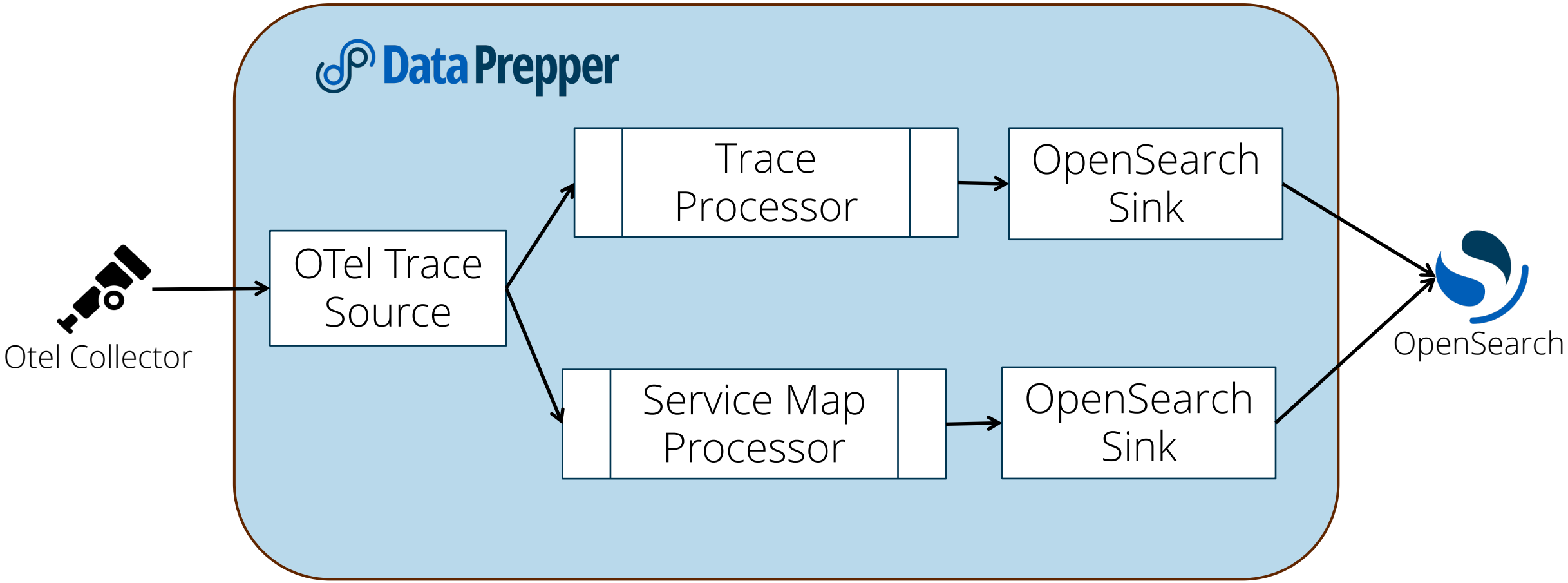
Pipelines - Routing



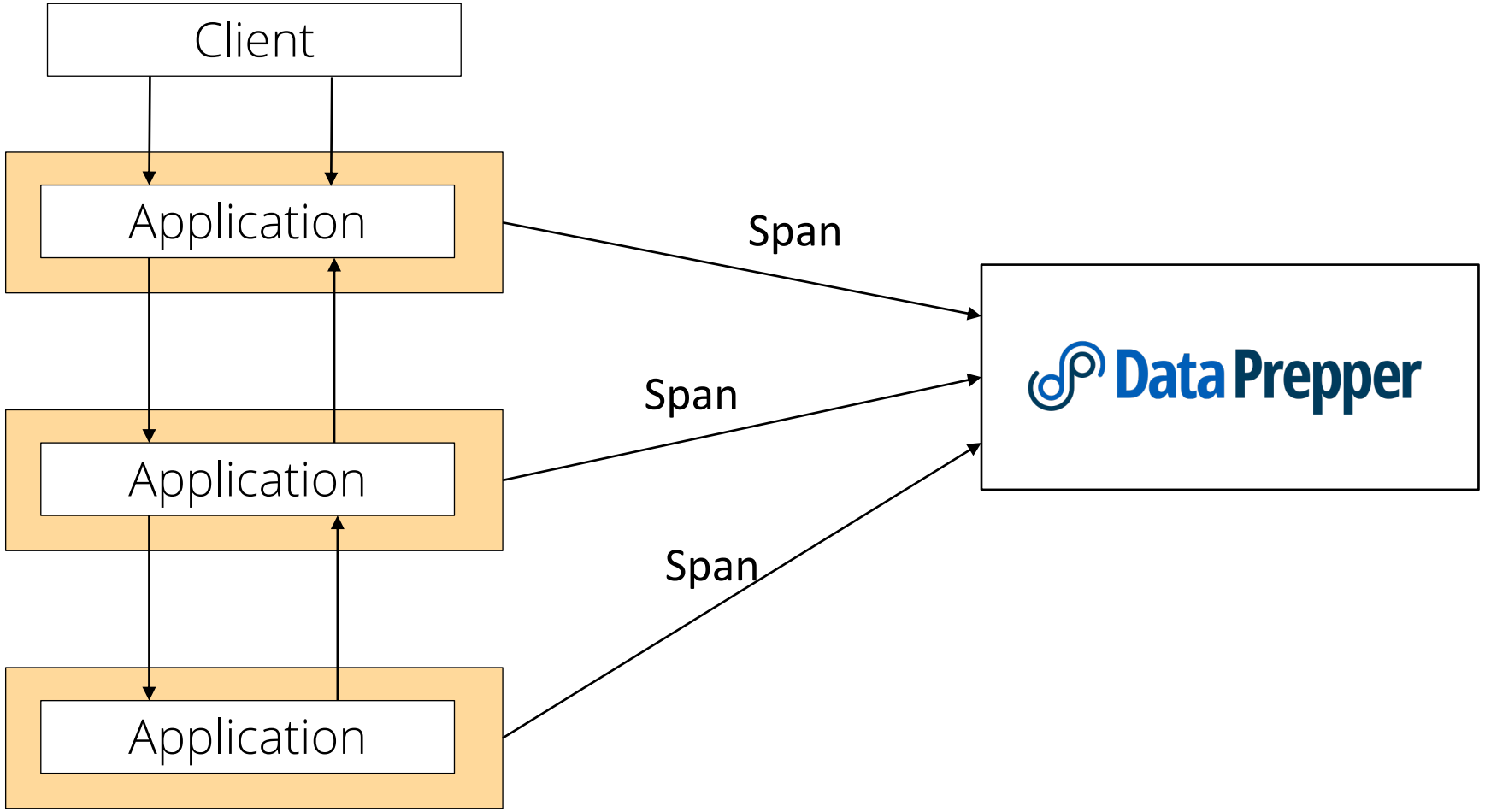
Trace Analytics



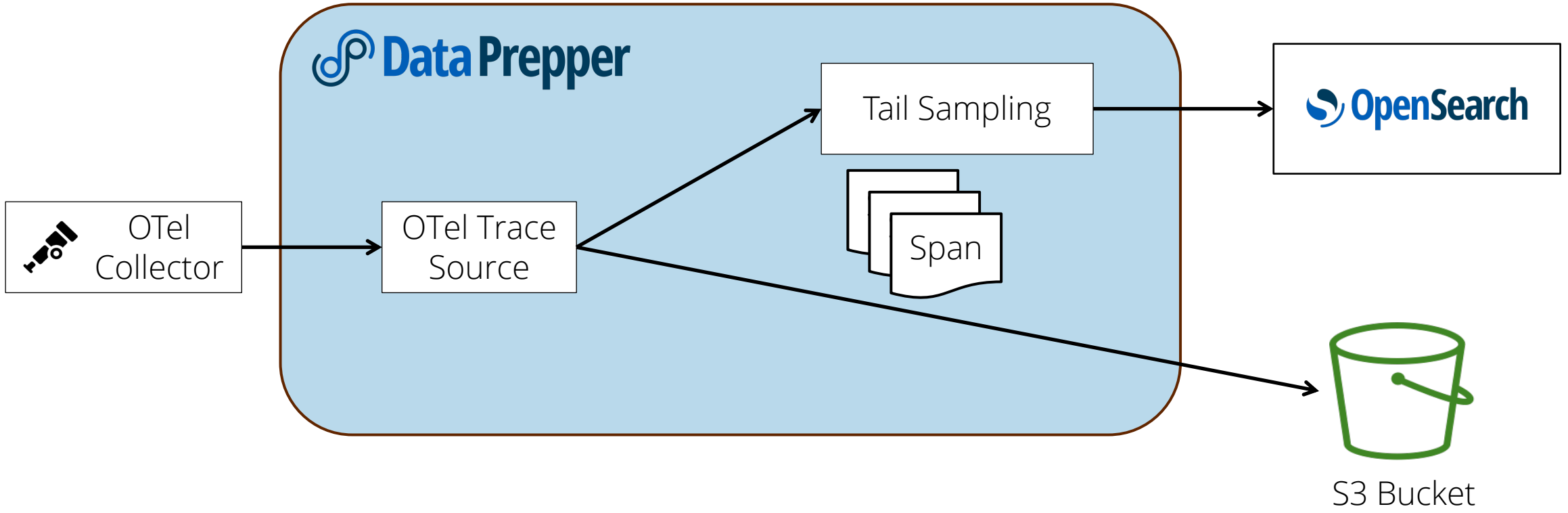
Trace Analytics - Pipeline



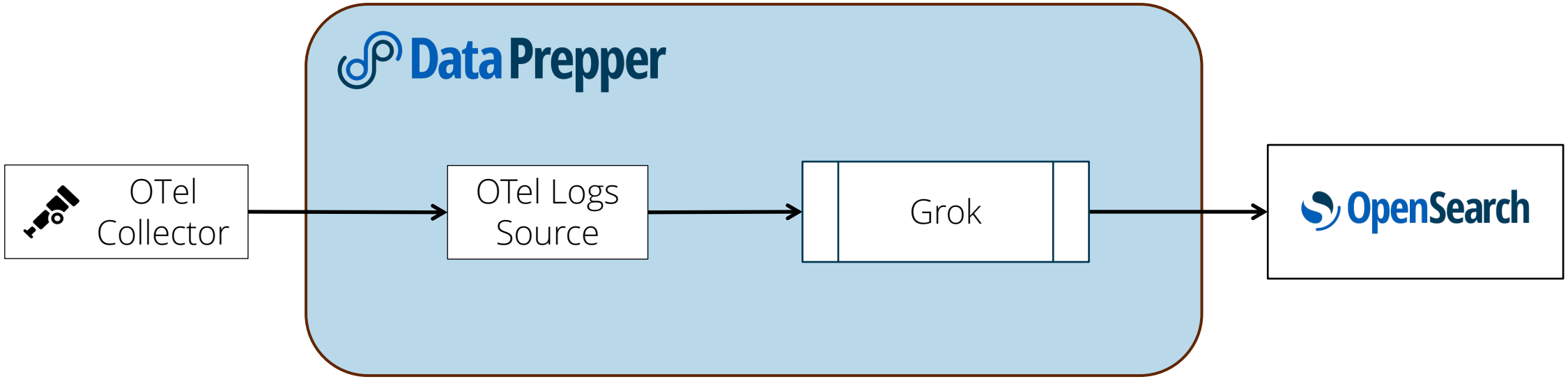
Trace Analytics – Tail Sampling



Trace Analytics – Tailing Sampling Pipeline



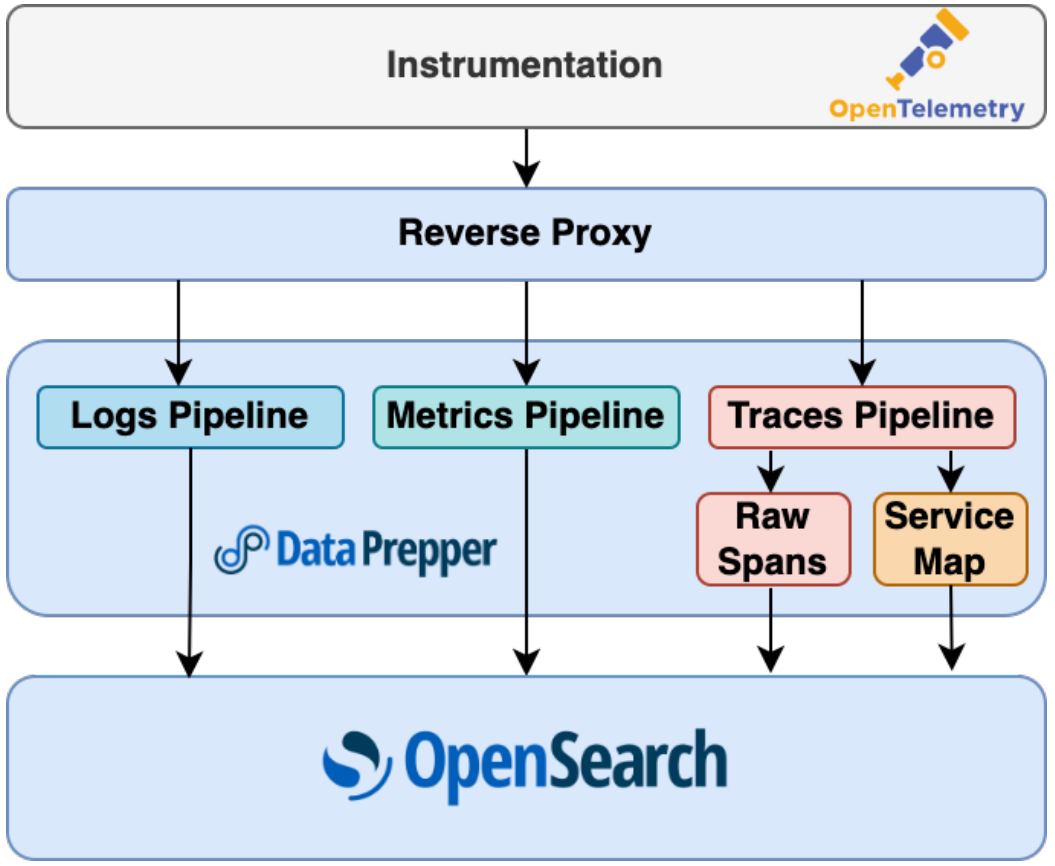
Log Analytics –Pipeline



How SAP Cloud Logging runs Data Prepper in Production

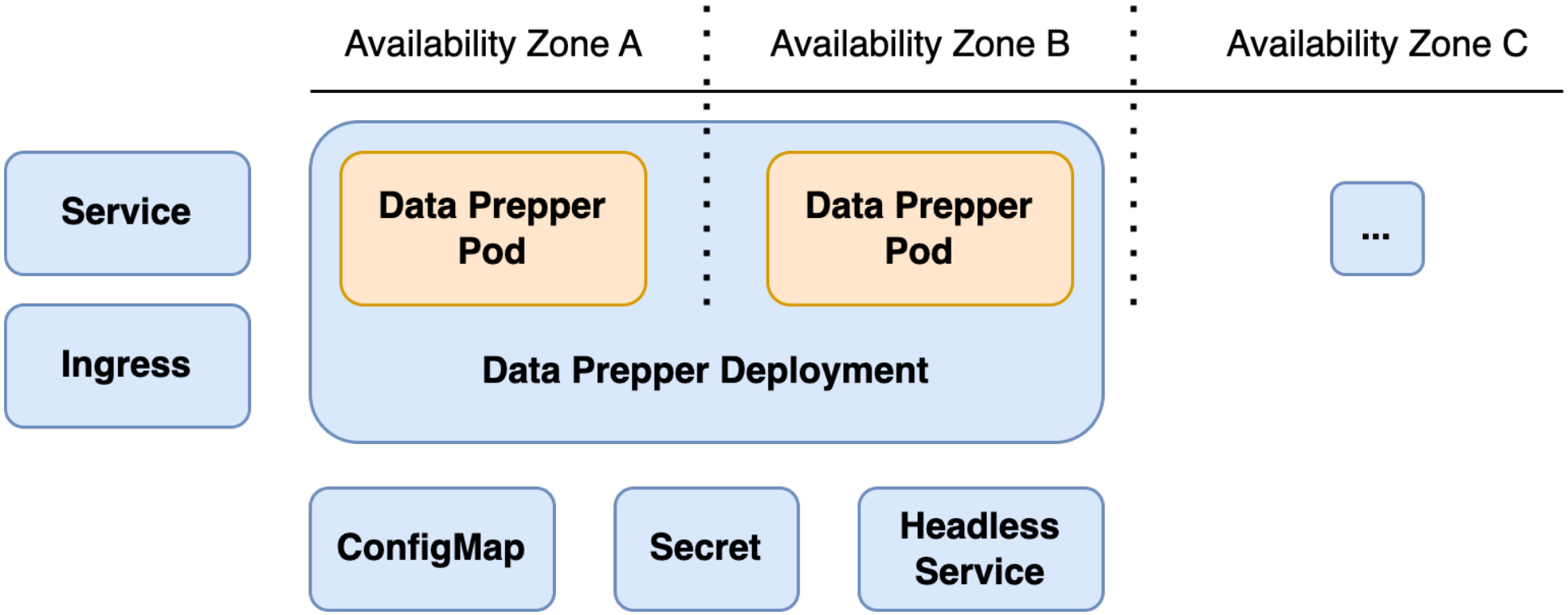
Component Architecture

- Sender: OTel-instrumented applications (or OpenTelemetry Collector)
- Reverse Proxy
  - Unified ingestion endpoint (gRPC)
  - Load balancer
  - Authentication module: mTLS, certificate rotation
- Data Prepper: Pipelines for logs, metrics and traces
- OpenSearch: Data Prepper's sink

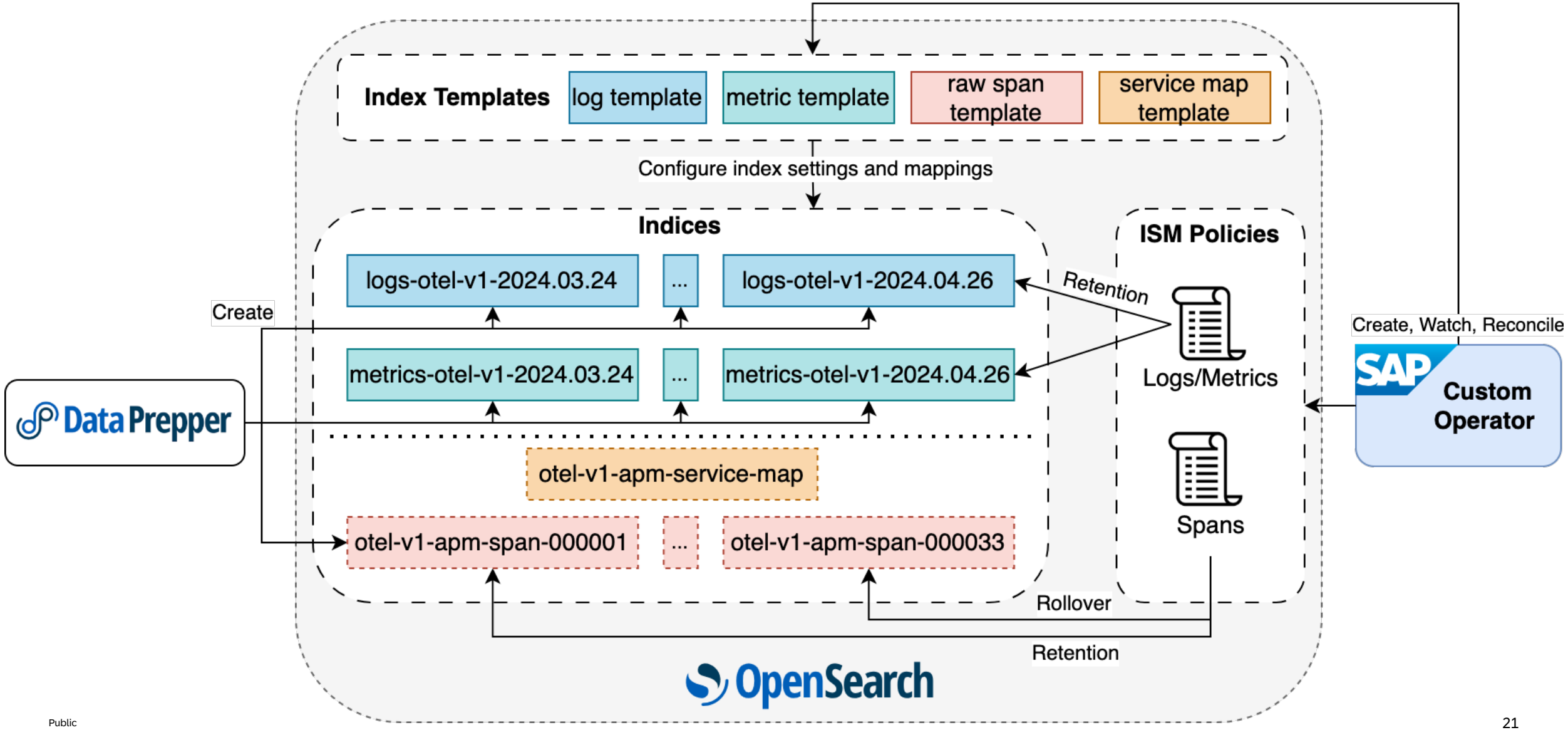


Running Data Prepper on Kubernetes

- Kubernetes objects for each instance
- Deployed by own Kubernetes operator

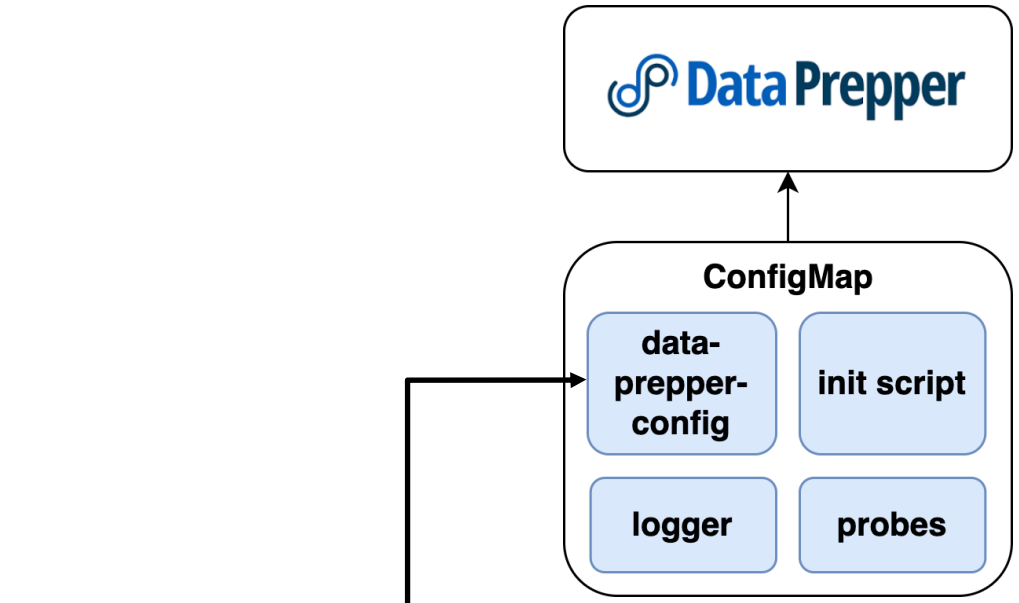


OpenSearch Objects



Data Prepper Configuration

- *data-prepper-config.yaml:*
  - Peer forwarder
  - Circuit breakers
- Init script:
  - Wait until OpenSearch & OpenSearch objects are ready
  - Start Data Prepper
- Other:
  - Logger, readiness/liveness probes



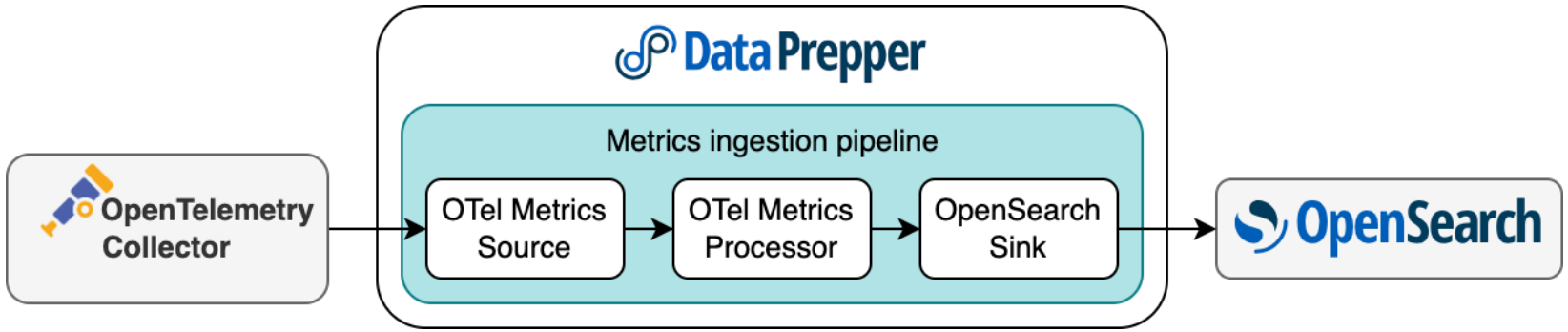

```
circuit_breakers:
  heap:
    usage: <value in MiB>
peer_forwarder:
  discovery_mode: "dns"
  domain_name: "data-prepper-headless"
  buffer_size: 512
  batch_size: 48
```

Metric Ingestion with Data Prepper

Configure workers, `buffer_size`, `batch_size`
=> Performance impact

- OpenSearch sink:
  - Basic authentication
  - Daily index created by *Data Prepper*

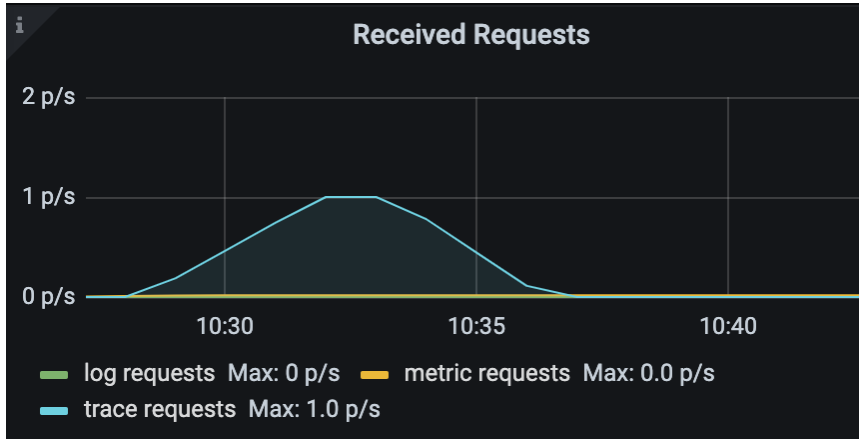
```yaml
metrics-pipeline:
  workers: 4
  source:
    otel_metrics_source:
  buffer:
    bounded_blocking:
      buffer_size: 512
      batch_size: 8
  processor:
    - otel_metrics:
  sink:
    - opensearch:
        hosts: [ "https://opensearch-service:9200" ]
        username: "otelWriter"
        password: "Password123"
        index: metrics-otel-v1-%{yyyy.MM.dd}
```

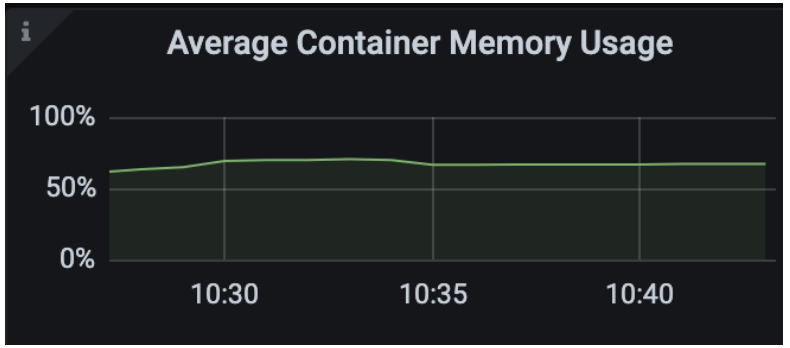


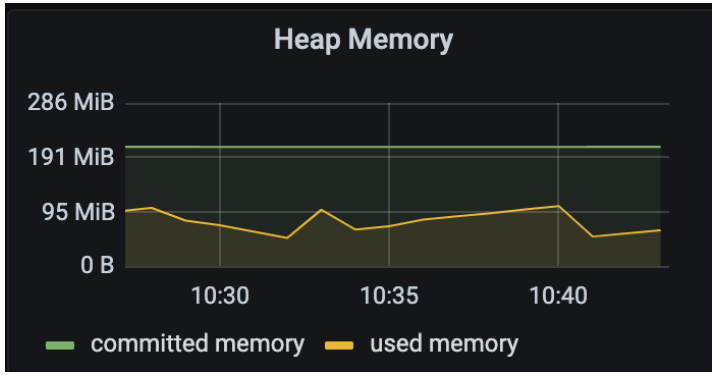
OpenSearch blog post by team member Karsten Schnitter

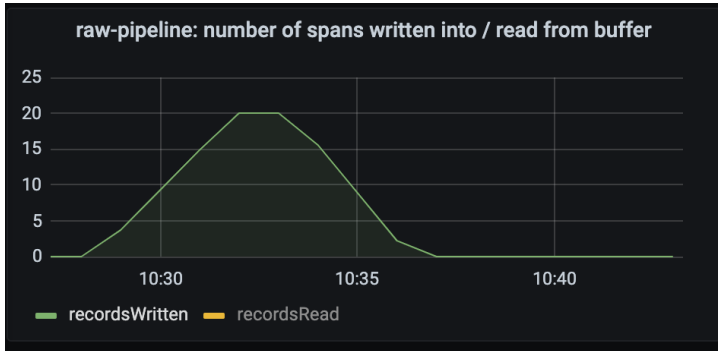
Monitoring Data Prepper

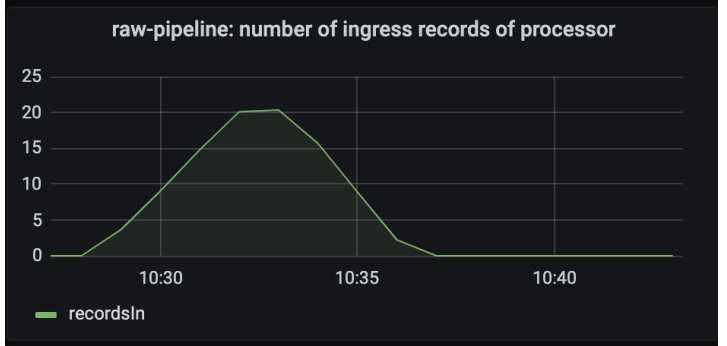
- K8s resource consumption
- JVM Heap
- Circuit Breaker & Peer forwarder
- Indexing in OpenSearch
- Every pipeline:
  - Received requests
  - Records in/out of buffer/processor sink
  - Pipeline latency
  - Buffer usage
  - ...

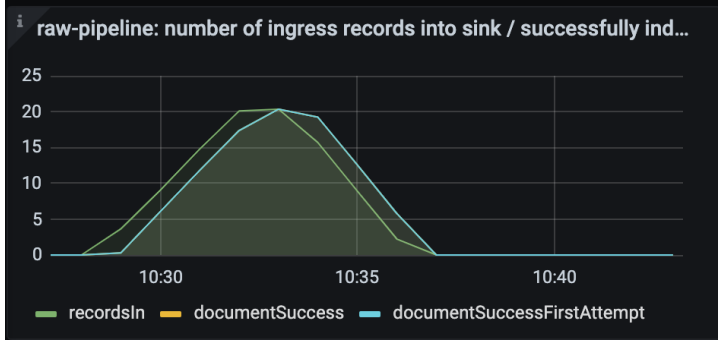


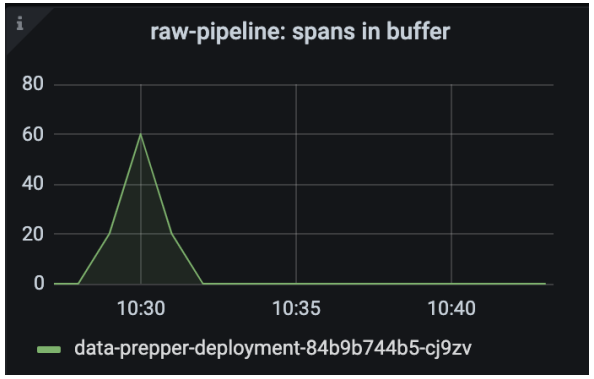




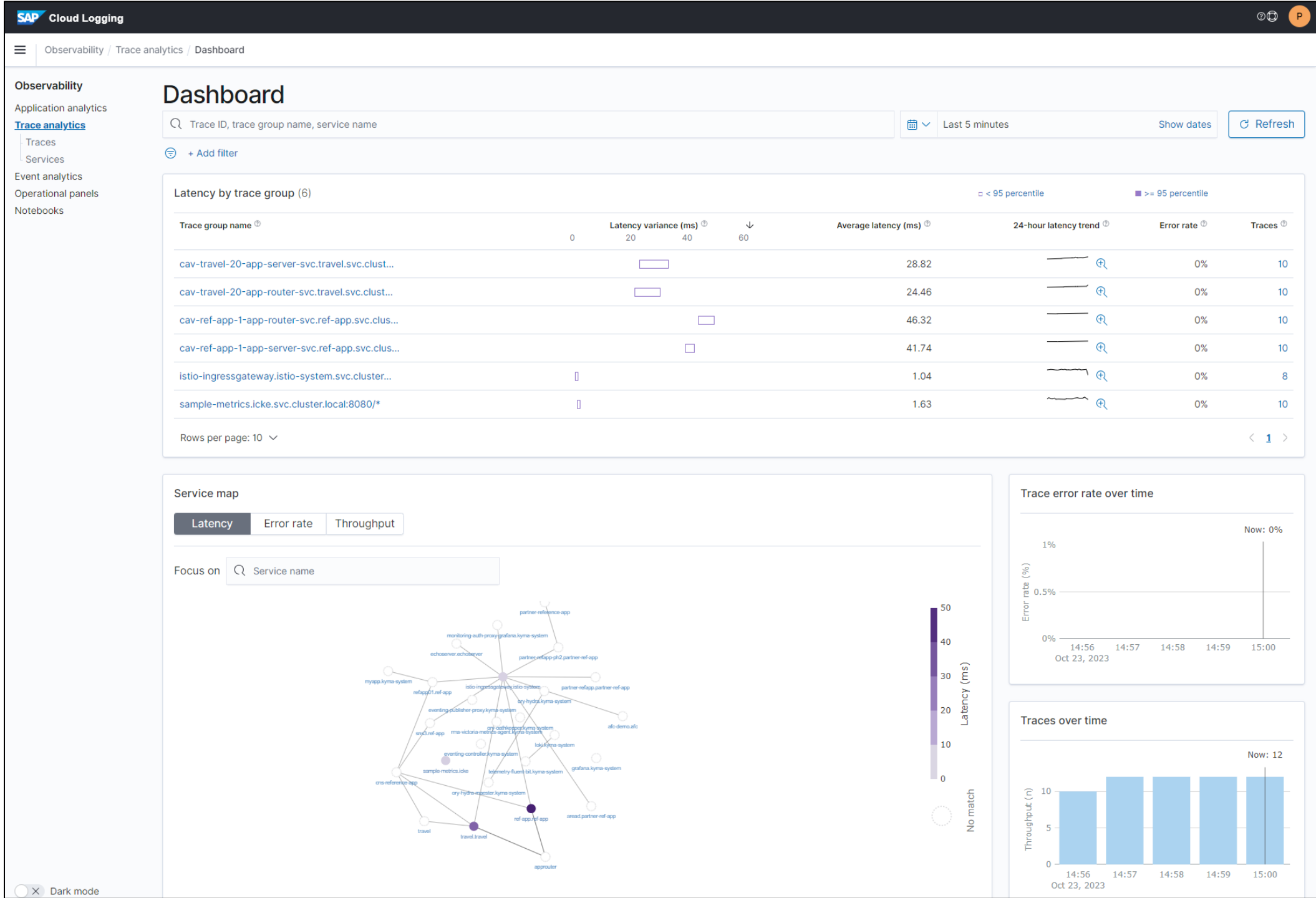








Trace Analytics Plugin



Observability / Trace analytics / Traces / f3b32b869a4bf2ab70b035c8593c4bd7

f3b32b869a4bf2ab70b035c8593c4bd7

Overview

Trace ID
f3b32b869a4bf2ab70b035c8593c4bd7

Latency
91.41

Errors
No

Trace group name
/helloWorld

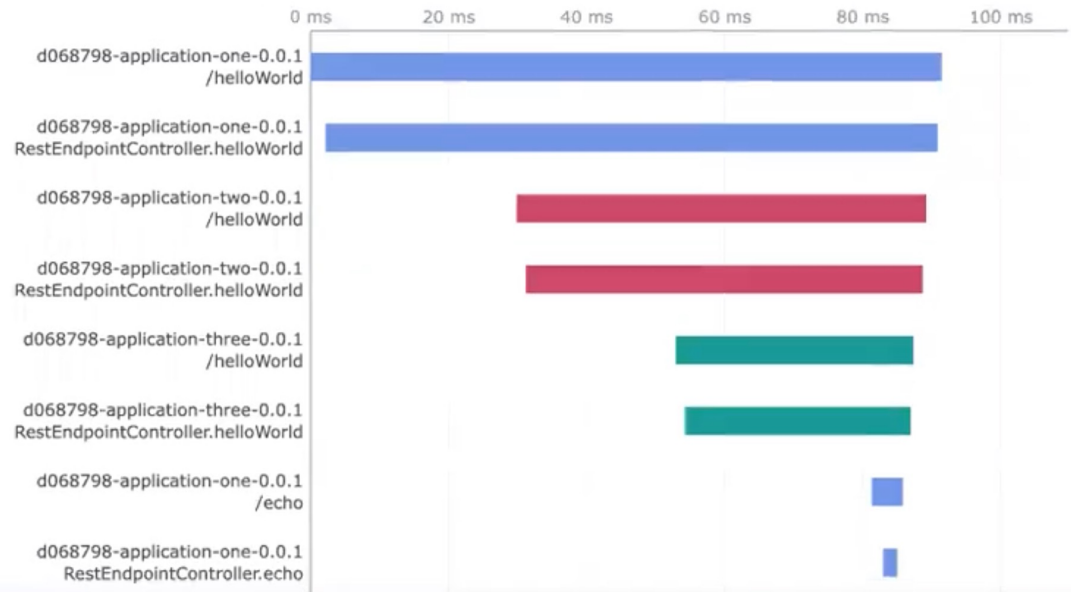
Last updated
09/20/2022 15:23:11

Time spent by service

d068798-application-one-0.0.1	50.35%
d068798-application-two-0.0.1	31.54%
d068798-application-three-0.0.1	18.11%

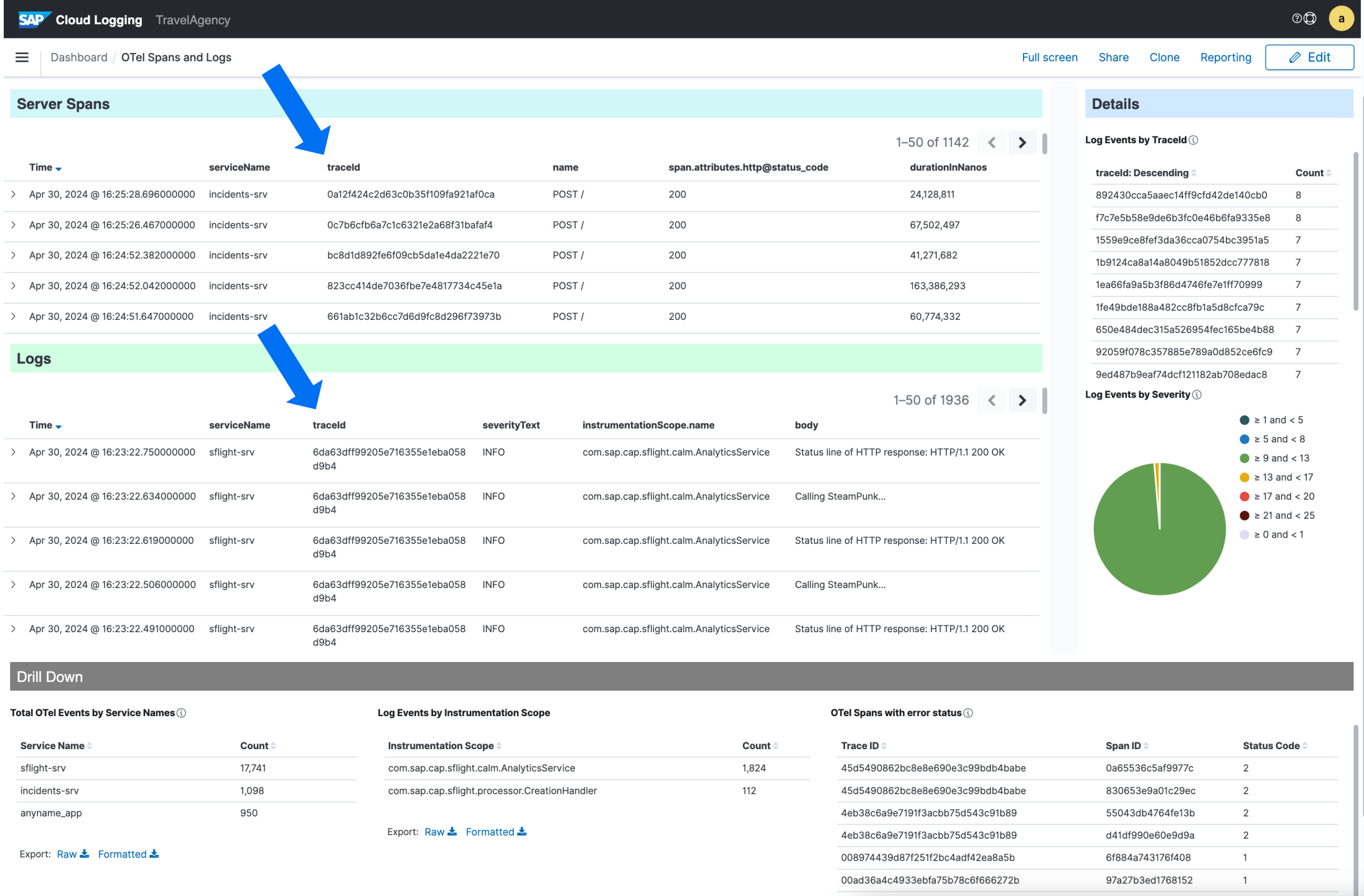
Spans (8)

Timeline | Span list



Content

- OTel spans and logs
- OTel metrics explorer



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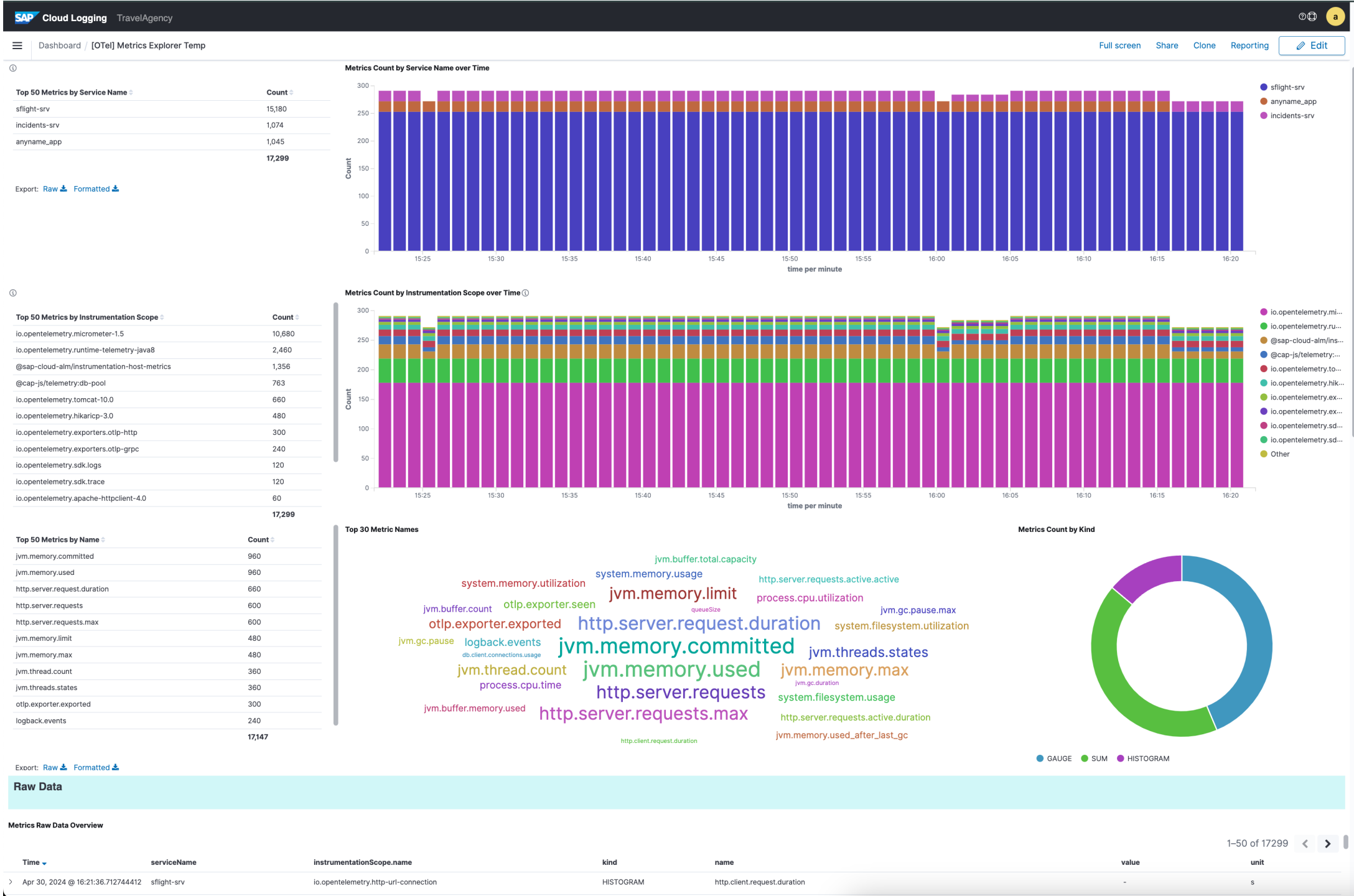


Performance: High-Level Insights

Performance affecting parameters

- Data Prepper resources: CPU limit, memory limit, heap size (*2.9GB*), replicas
- Data Prepper configuration: `circuit_breakers` (*95% of heap*)
  peer forwarder: `buffer_size`, `batch_size`
- Pipeline configuration: `buffer_size`, `batch_size`, `worker`, `delay`

Results

- Ingestion Rates:
  - **Logs: 30000 log records / s**
  - **Metrics: 30000 metric data points / s**
  - **Traces: 5000 trace spans / s**
- Bottleneck: Peer forwarder (traces) /
  Our OpenSearch capacity (logs, metrics)

Performance: Challenges & Learnings

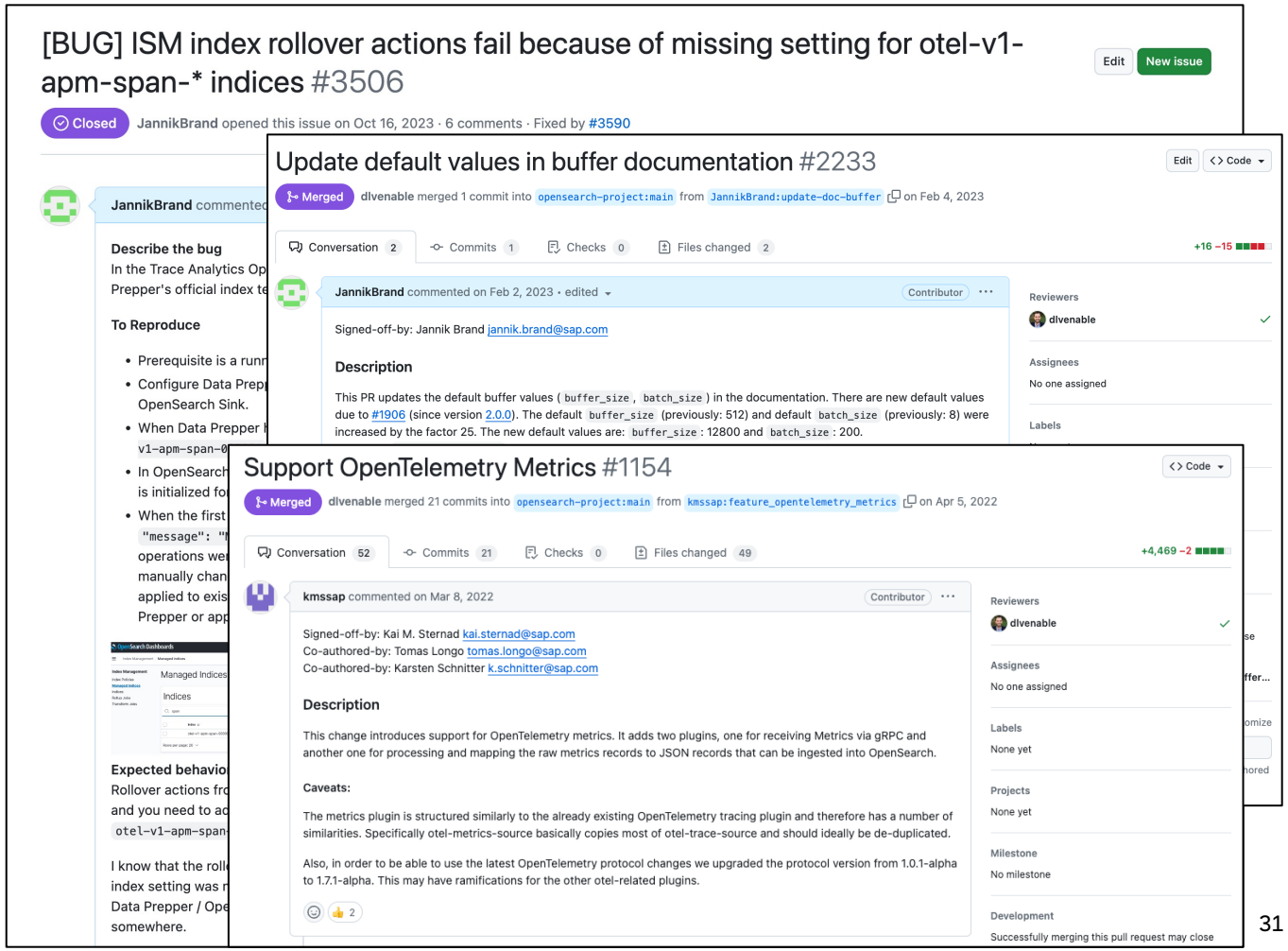
- Horizontal scaling for traces
- Stability (in overload scenarios)
  - Prevent container and heap OOM errors ⚡ => Generate back-pressure
  - Container OOM:
    - Finding optimal heap setting (how much space needed for non-heap)
  - Heap OOM:
    - Find optimal buffer sizes
    - Circuit breakers
- Simultaneous ingestion of logs, metrics and traces

OpenSearch Community & SAP Cloug Logging team

Data Prepper contributions:

- Issues and PRs
  - E.g.: Support OpenTelemetry logs & metrics; Performance feedback
- Team member Karsten Schnitter added as a maintainer
- Data Prepper team: Recommendations for performance improvements

OpenSearch/ElasticSearch: >6 year journey



Thank you.

Contact information:

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David Venable
dlv@amazon.com

References to our talks at OpenSearch Con Berlin 2024

- Hariharan Gandhi – Part of Keynote
- David Venable – Persistent and performant ingestion using Data Prepper
- This talk