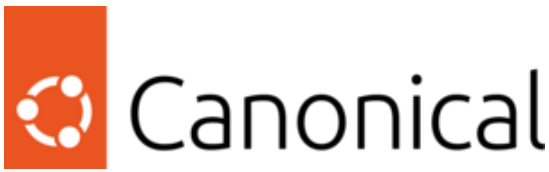
Journey from **Fluent Bit**, **Fluentd** and **Prometheus** to

OpenTelemetry Collector

Marcin "Perk" Stożek



Collectors Zoo

Collectors Zoo

OpenTelemetry

Collectors Zoo

OpenTelemetry

where it all started?

de facto k8s telemetry data collection standards in early 2023

logs

metrics

Prometheus

traces

?

logs

a lot of plugins

community, documentation

written in Ruby

logs

logs

Exhibit 1 - kubeclient gem

used by more than 1k projects

1 (one) active maintainer

logs

Exhibit 2 - multithreading vs HPA

1 worker = 1 thread

resources.requests.cpu = 2000

autoscaling.targetCPUUtilizationPercentage = 50

logs

metrics

Prometheus

traces

?

logs

crazy fast

great memory usage

written in C

logs

fluentbit

logs

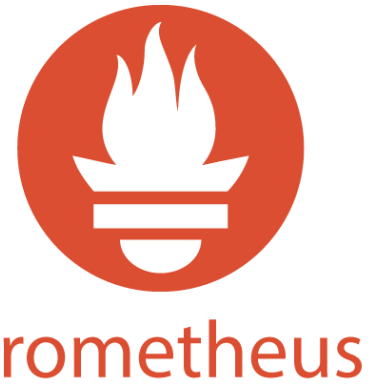
metrics

Prometheus

traces

?

metrics



community, documentation

memory usage

database, not a forwarder *

logs

metrics

Prometheus

traces

?

traces

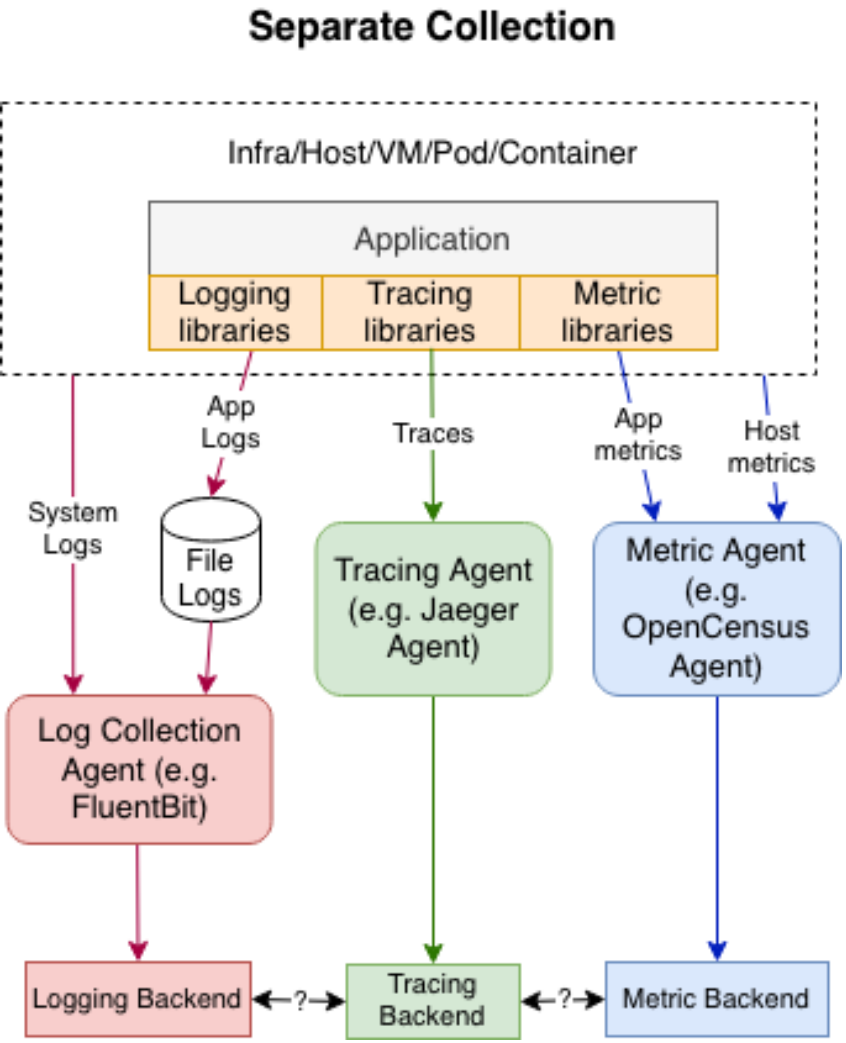
?

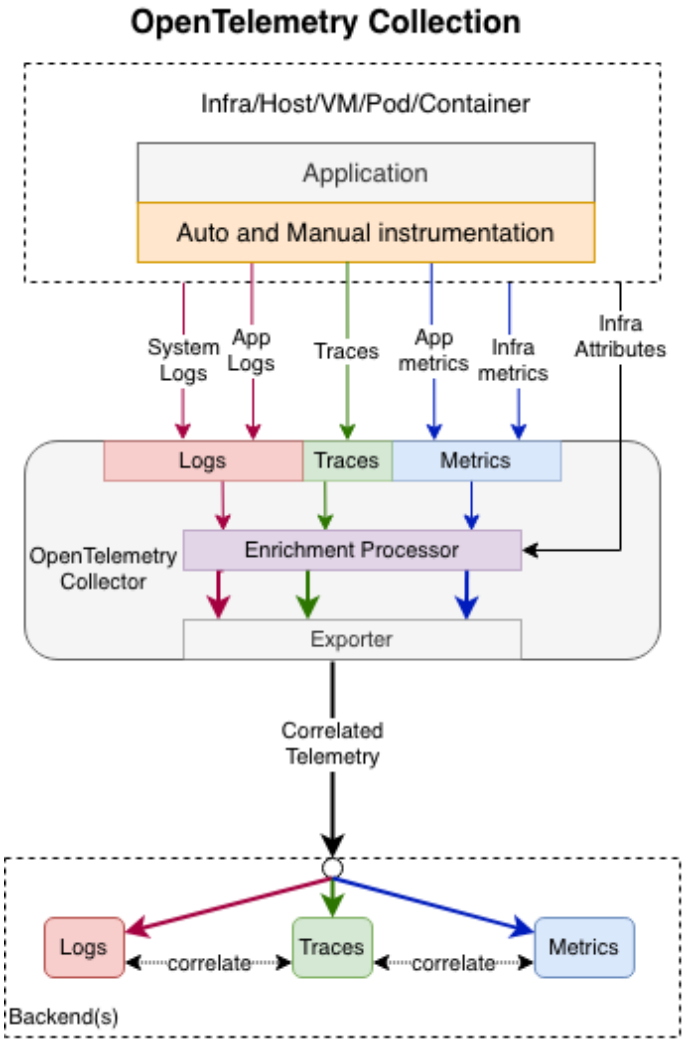
traces

why?

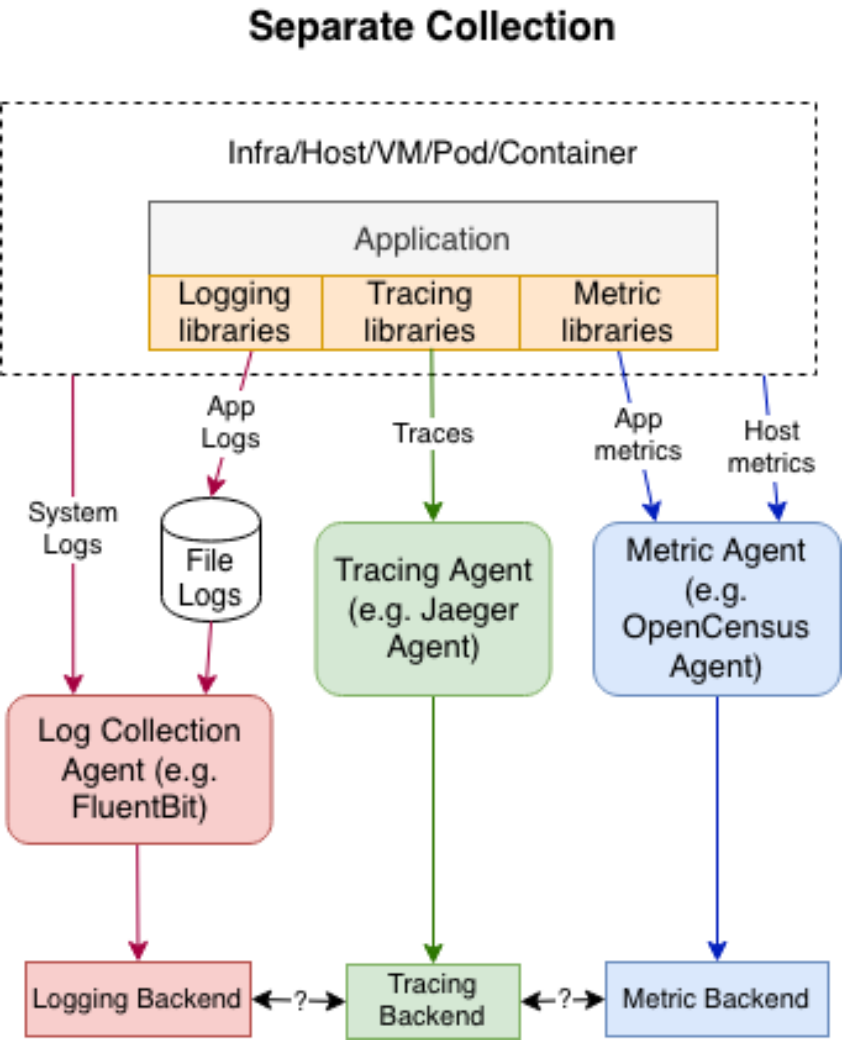
OpenTelemetry

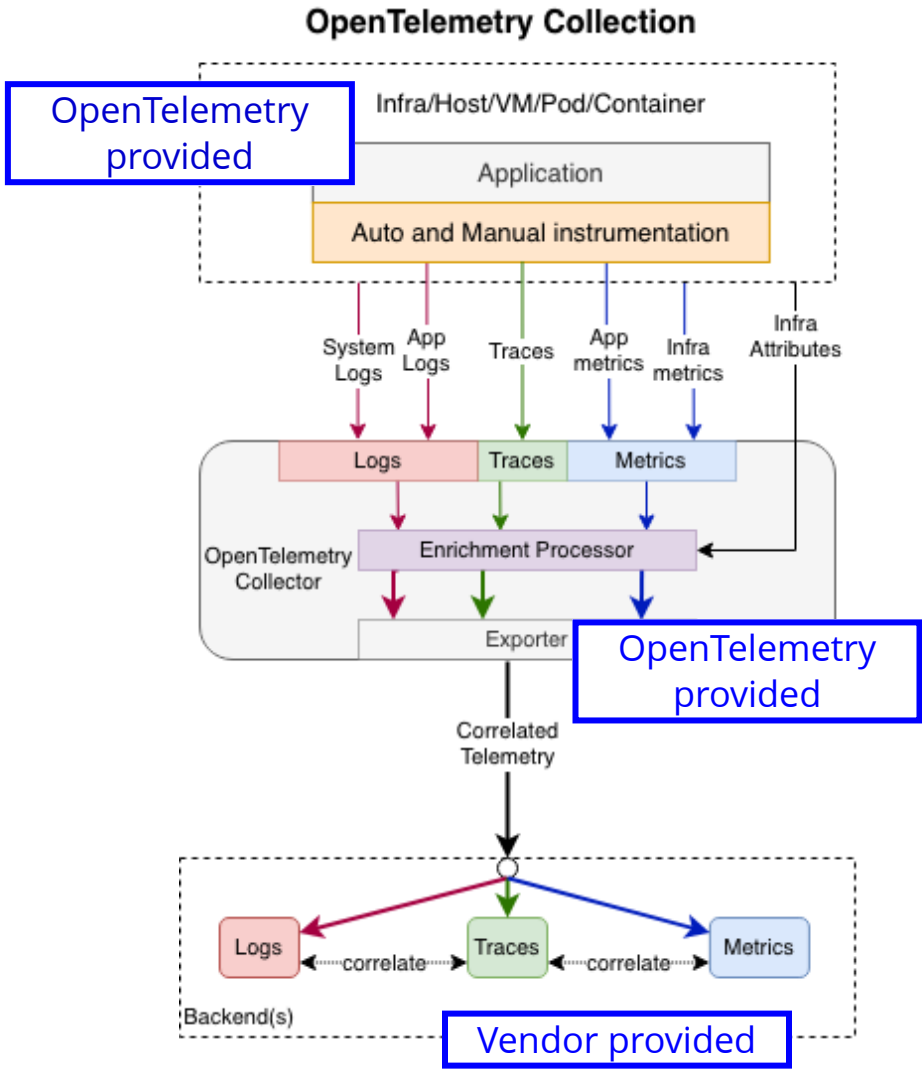
101





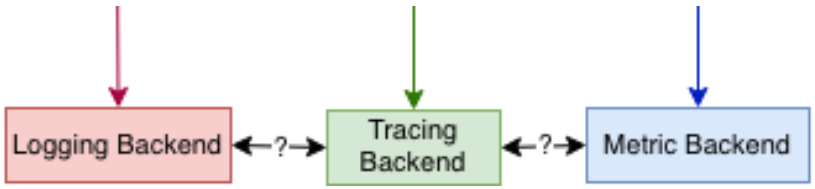
https://github.com/open-telemetry/opentelemetry-specification/blob/main/specification/logs/overview.md

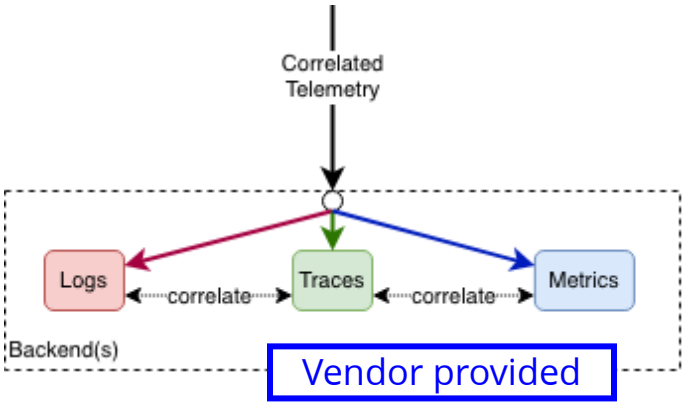




https://github.com/open-telemetry/opentelemetry-specification/blob/main/specification/logs/overview.md

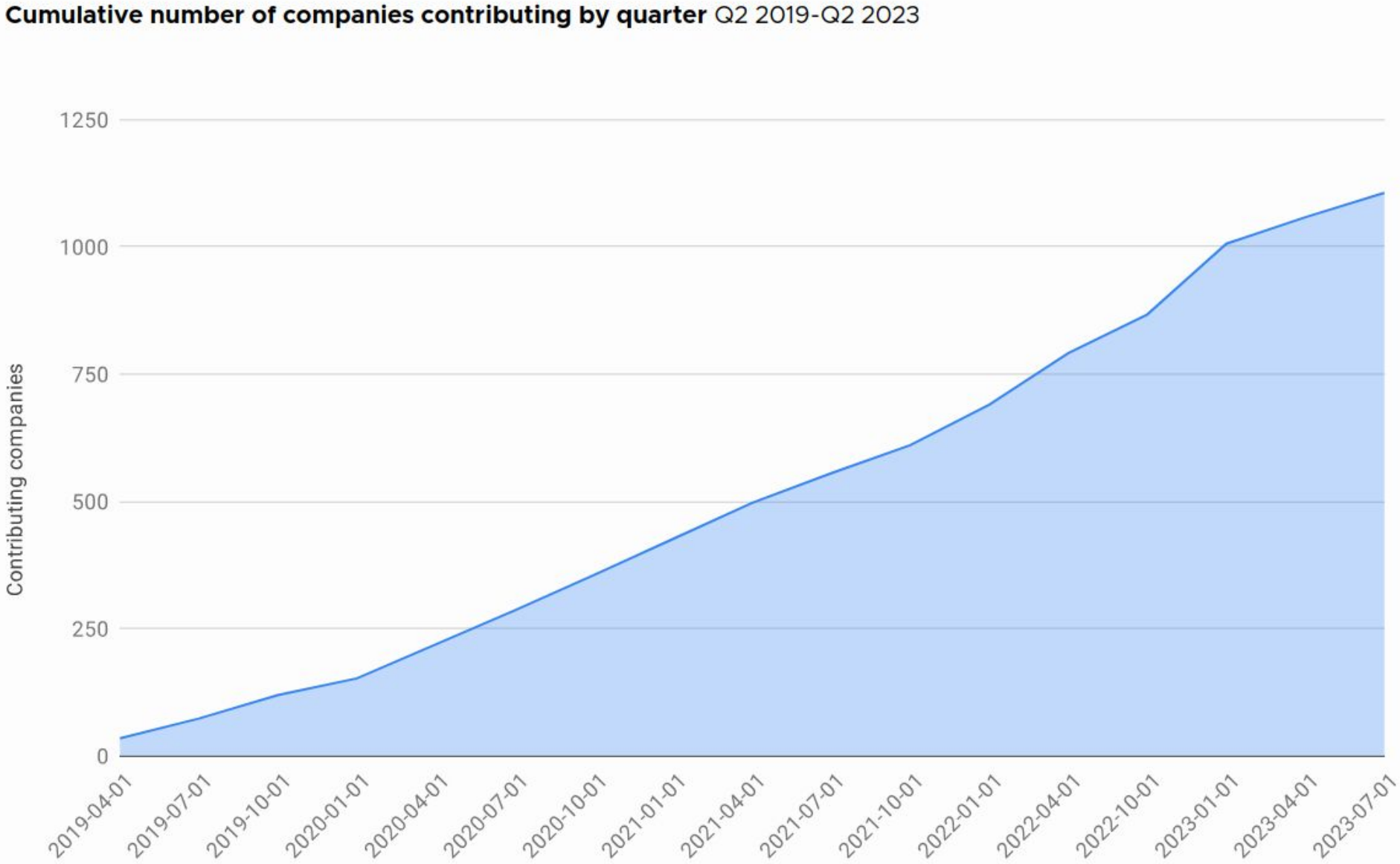
No OpenTelemetry backend





https://github.com/open-telemetry/opentelemetry-specification/blob/main/specification/logs/overview.md

Vendor support



www.cncf.io/reports/opentelemetry-project-journey-report/

OpenTelemetry

Specification

Language SDKs

Collector

OpenTelemetry

Specification

Language SDKs

Collector

Specification

Guidelines - cross language requirements and expectations for all implementations

Semantic conventions

API, SDK

OTLP

https://github.com/open-telemetry/opentelemetry-specification

Specification

Guidelines - cross language requirements and expectations for all implementations

Semantic Conventions

API, SDK

OTLP

Community driven industry standard

https://github.com/open-telemetry/opentelemetry-specification

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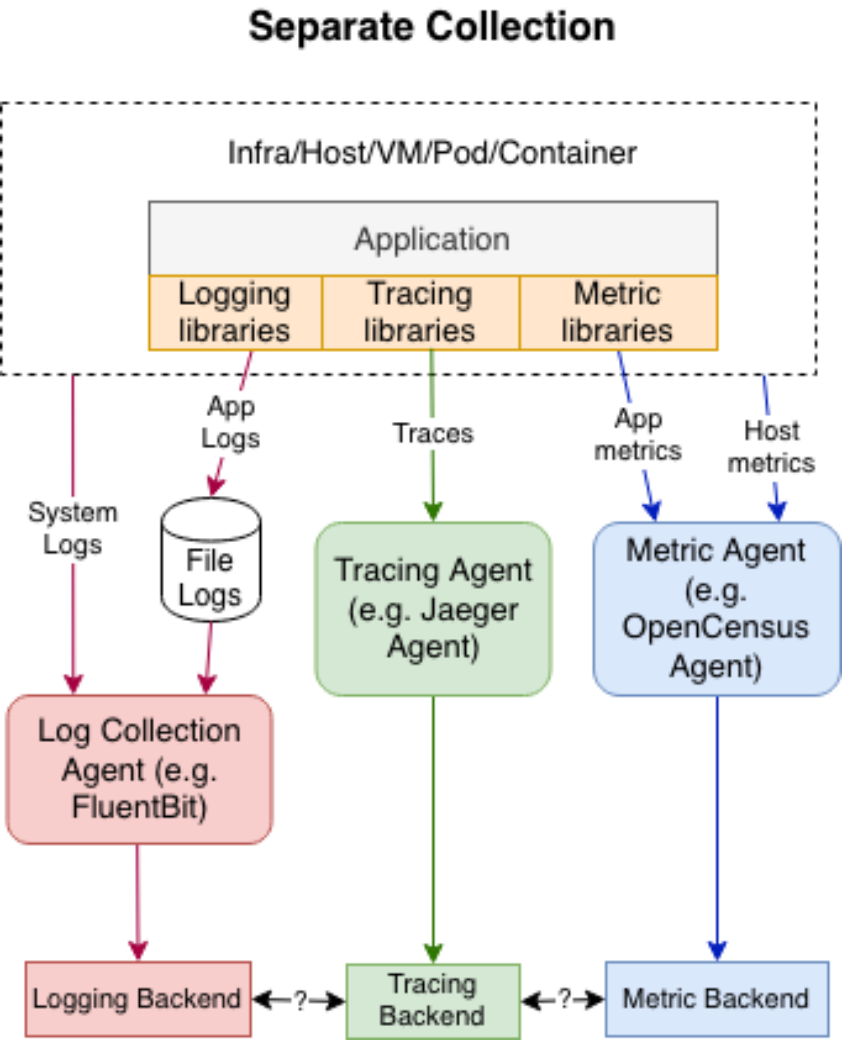
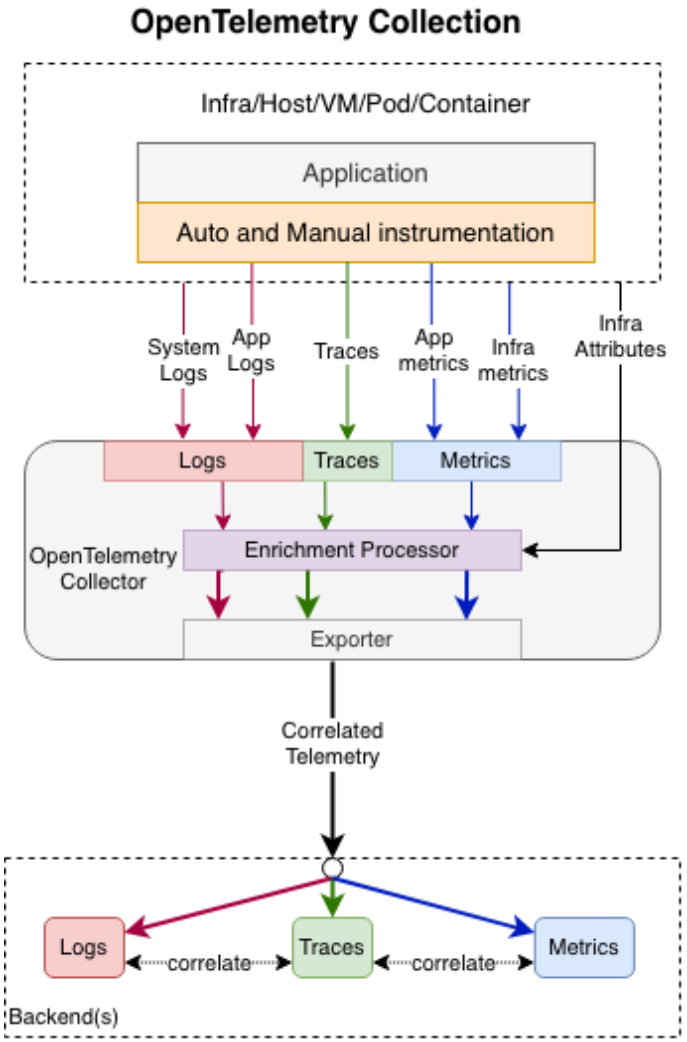
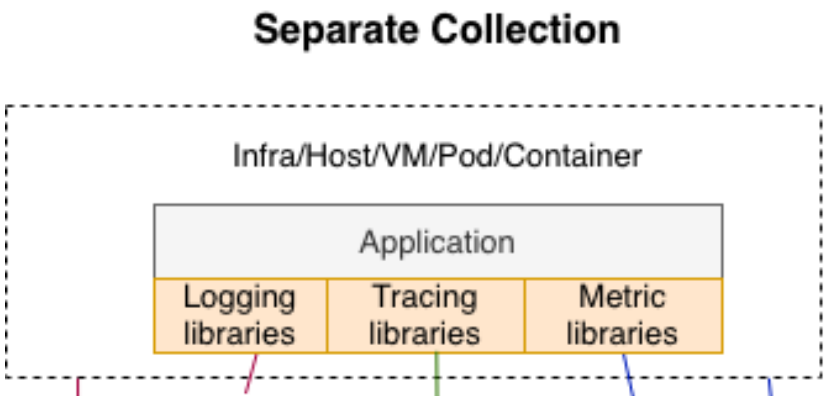
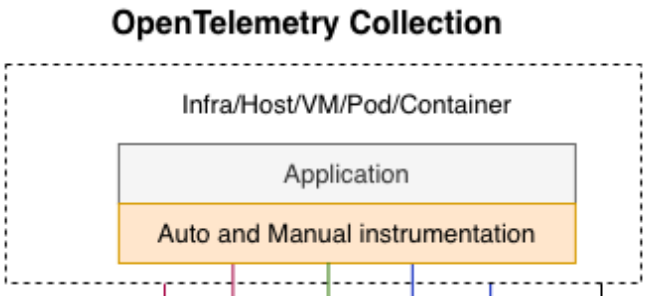




https://github.com/open-telemetry/opentelemetry-specification/blob/main/specification/logs/overview.md

Instrumentation





https://github.com/open-telemetry/opentelemetry-specification/blob/main/specification/logs/overview.md

Language SDKs

Traces

Feature	Optional	Go	Java	JS	Python	Ruby	Erlang	PHP	Rust	C++	.NET	Swift
TracerProvider												
Create TracerProvider		+	+	+	+	+	+	+	+	+	+	+
Get a Tracer		+	+	+	+	+	+	+	+	+	+	+
Get a Tracer with schema_url		+	+							+		
Associate Tracer with InstrumentationScope												
Safe for concurrent calls		+	+	+	+	+	+	+	+	+	+	+
Shutdown (SDK only required)		+	+	+	+	+	+	+	+	+	+	+
ForceFlush (SDK only required)		+	+	-	+	+	+	+	+	+	+	+
Trace / Context interaction												
Get active Span		N/A	+	+	+	+	+	+	+	+	+	+
Set active Span		N/A	+	+	+	+	+	+	+	+	+	+
Tracer												
Create a new Span		+	+	+	+	+	+	+	+	+	+	+
Documentation defines adding attributes at span creation as preferred											+	
Get active Span		N/A	+	+	+	+	+	+	+	+	+	+

https://github.com/open-telemetry/opentelemetry-specification/blob/main/spec-compliance-matrix.md

OpenTelemetry

Specification

Language SDKs

Collector

OpenTelemetry

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Language SDKs

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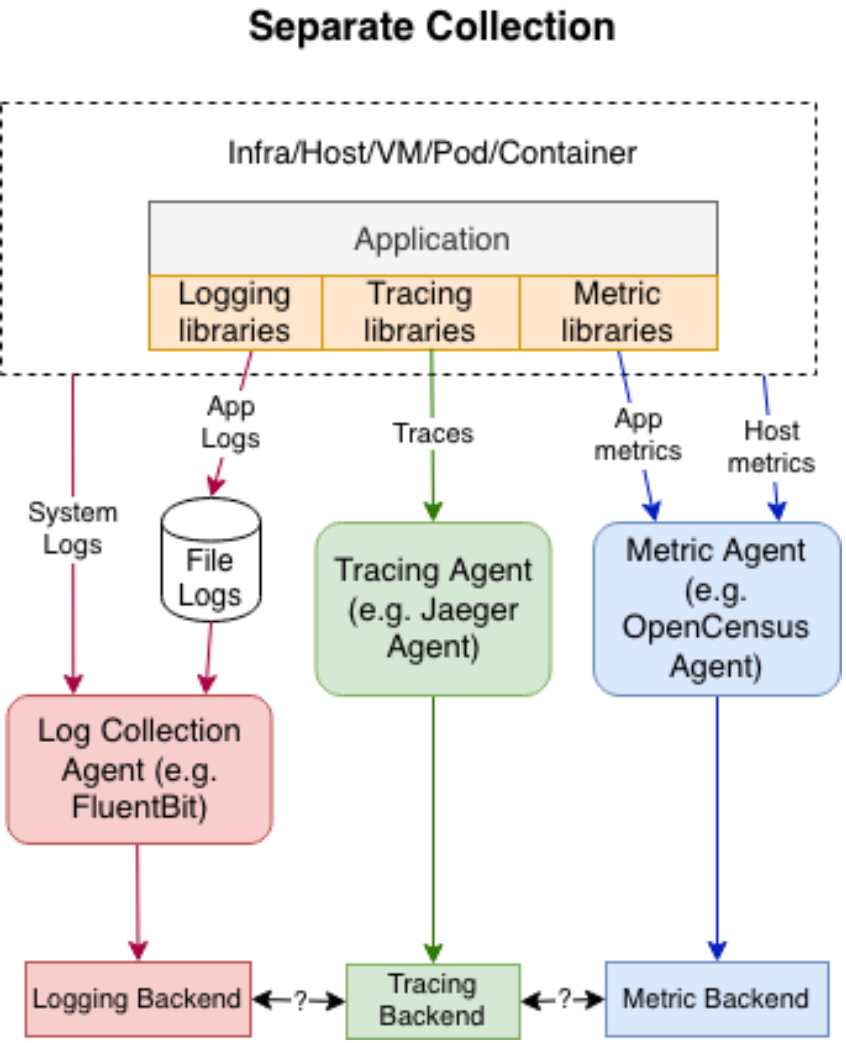
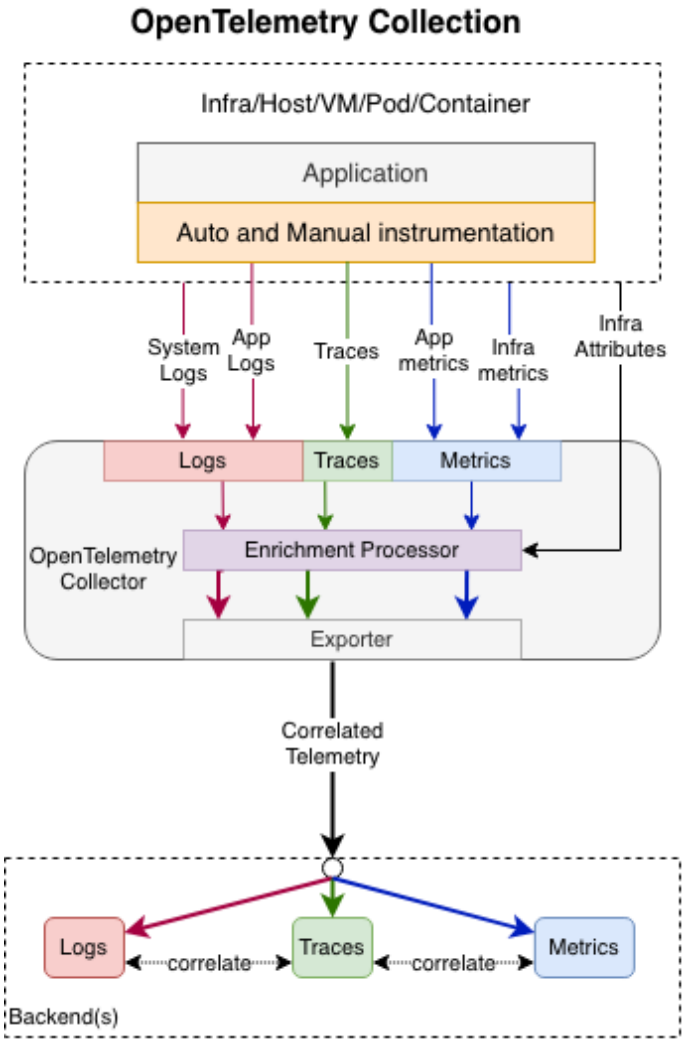
OpenTelemetry Collector

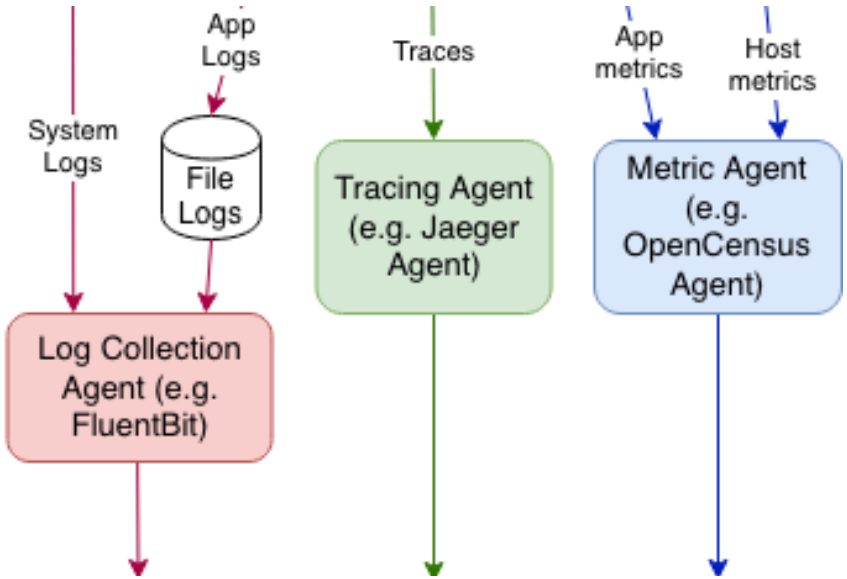
101

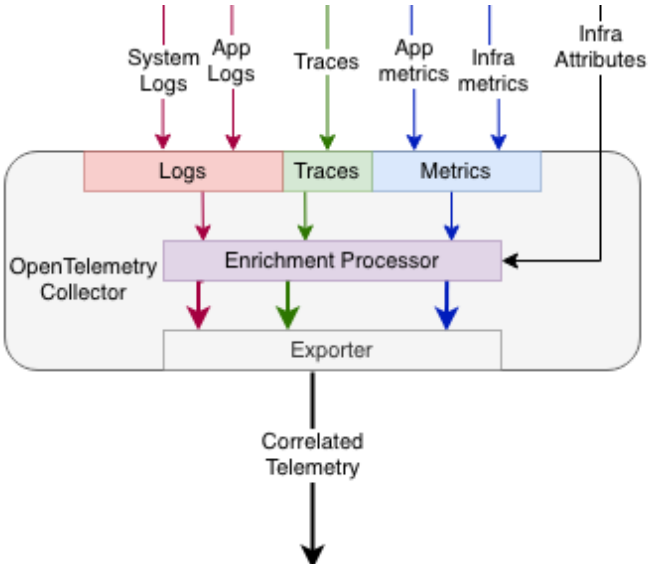




https://github.com/open-telemetry/opentelemetry-specification/tree/v1.21.0/specification/logs

Collection





https://github.com/open-telemetry/opentelemetry-specification/blob/main/specification/logs/overview.md

OpenTelemetry Collector

https://opentelemetry.io/docs/collector/

OpenTelemetry Collector

Receivers

https://opentelemetry.io/docs/collector/

OpenTelemetry Collector

Receivers

Processors

https://opentelemetry.io/docs/collector/

OpenTelemetry Collector

Receivers

Processors

Exporters

https://opentelemetry.io/docs/collector/

OpenTelemetry Collector

Receivers

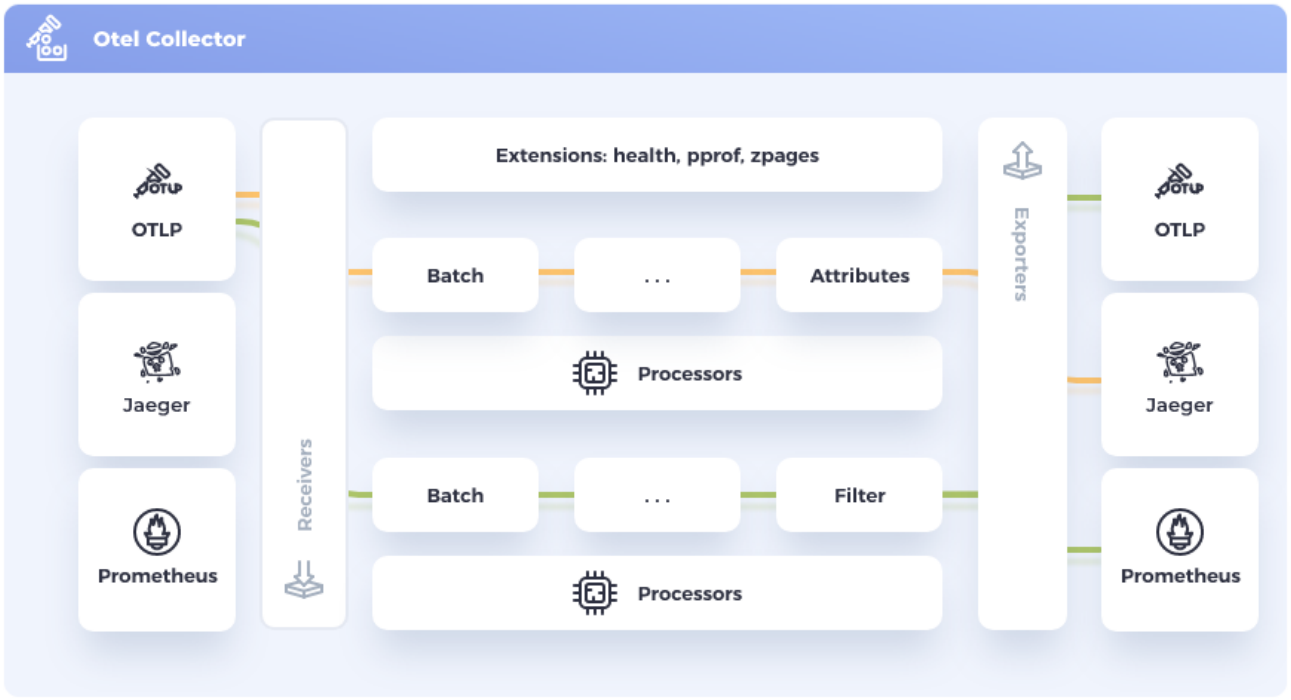
Processors

Exporters

Pipelines

https://opentelemetry.io/docs/collector/

OpenTelemetry Collector aka otelcol



OTEL COLLECTOR

https://opentelemetry.io/docs/collector/

Host Metrics Receiver

Host Metrics Receiver

Status	
Stability	beta
Supported pipeline types	metrics
Distributions	core, contrib, observiq, splunk, sumo

The Host Metrics receiver generates metrics about the host system scraped from various sources. This is intended to be used when the collector is deployed as an agent.

Getting Started

The collection interval, root path, and the categories of metrics to be scraped can be configured:

```
hostmetrics:
  collection_interval: <duration> # default = 1m
  root_path: <string>
  scrapers:
    <scraper1>:
    <scraper2>:
    ...
```

The available scrapers are:

Scraper	Supported OSs	Description
cpu	All except Mac[1]	CPU utilization metrics
disk	All except Mac[1]	Disk I/O metrics
load	All	CPU load metrics
filesystem	All	File System utilization metrics

https://github.com/open-telemetry/opentelemetry-collector-contrib/tree/v0.78.0/receiver/hostmetricsreceiver

Resource Detection Processor

Resource Detection Processor

Status	
Stability	beta: traces, metrics, logs
Distributions	contrib, observiq, splunk, sumo

The resource detection processor can be used to detect resource information from the host, in a format that conforms to the OpenTelemetry resource semantic conventions, and append or override the resource value in telemetry data with this information.

Supported detectors

Environment Variable

Reads resource information from the `OTEL_RESOURCE_ATTRIBUTES` environment variable. This is expected to be in the format `<key1>=<value1>,<key2>=<value2>,...`, the details of which are currently pending confirmation in the OpenTelemetry specification.

Example:

```
processors:
  resourcedetection/env:
    detectors: [env]
    timeout: 2s
    override: false
```

System metadata

Note: use the Docker detector (see below) if running the Collector as a Docker container.

Queries the host machine to retrieve the following resource attributes:

```
* host.name
* host.id
* os.type
```

https://github.com/open-telemetry/opentelemetry-collector-contrib/tree/v0.78.0/processor/resourcedetectionprocessor

OTLP Exporter

OTLP gRPC Exporter

Status	
Stability	traces stable
	metrics stable
	logs beta
Supported pipeline types	traces, metrics, logs
Distributions	core, contrib

Export data via gRPC using OTLP format. By default, this exporter requires TLS and offers queued retry capabilities.

Getting Started

The following settings are required:

- `endpoint` (no default): host:port to which the exporter is going to send OTLP trace data, using the gRPC protocol. The valid syntax is described here. If a scheme of `https` is used then client transport security is enabled and overrides the `insecure` setting.
- `tls`: see TLS Configuration Settings for the full set of available options.

Example:

```yaml
exporters:
  otlp:
    endpoint: otelcol2:4317
    tls:
      cert_file: file.cert
      key_file: file.key
  otlp/2:
    endpoint: otelcol2:4317
    tls:
      insecure: true
```

https://github.com/open-telemetry/opentelemetry-collector/tree/v0.78.0/exporter/otlpexporter

Put it all together

```yaml
receivers:
  hostmetrics:
    scrapers:
      memory:

processors:
  resourcedetection/detect-host-name:
    detectors:
    - system
    system:
      hostname_sources:
      - os

exporters:
  otlp:
    endpoint: otelcol2:4317

service:
  pipelines:
    metrics:
      receivers:
      - hostmetrics
      processors:
      - resourcedetection/detect-host-name
      exporters:
      - otlp
```

Data Pipeline

```yaml
receivers:
  hostmetrics:
    scrapers:
      memory:

processors:
  resourcedetection/detect-host-name:
    detectors:
    - system
    system:
      hostname_sources:
      - os

exporters:
  otlp:
    endpoint: otelcol2:4317

service:
  pipelines:
    metrics:
      receivers:
      - hostmetrics
      processors:
      - resourcedetection/detect-host-name
      exporters:
      - otlp
```

More Data Pipelines

```
service:
  pipelines:
    metrics:
      receivers: [hostmetrics]
      processors: [resourcedetection/detect-host-name]
      exporters: [otlp]

    metrics/kafka:
      receivers: [kafka]
      exporters: [otlp/kafka]

    logs:
      receivers: [filelog]
      exporters: [otlp]

    logs/kafka:
      receivers: [kafka]
      exporters: [otlp, otlp/kafka]

    traces:
      receivers: [otlp, kafka]
      processors: [resourcedetection/detect-host-name]
      exporters: [otlp, otlp/kafka]
```

OTel Collector distros

OTel Collector distros

Core distribution

github.com/open-telemetry/opentelemetry-collector - components

OTel Collector distros

Core distribution

github.com/open-telemetry/opentelemetry-collector - components

Contrib distribution

https://github.com/open-telemetry/opentelemetry-collector-contrib - components

OTel Collector distros

Core distribution

github.com/open-telemetry/opentelemetry-collector - components

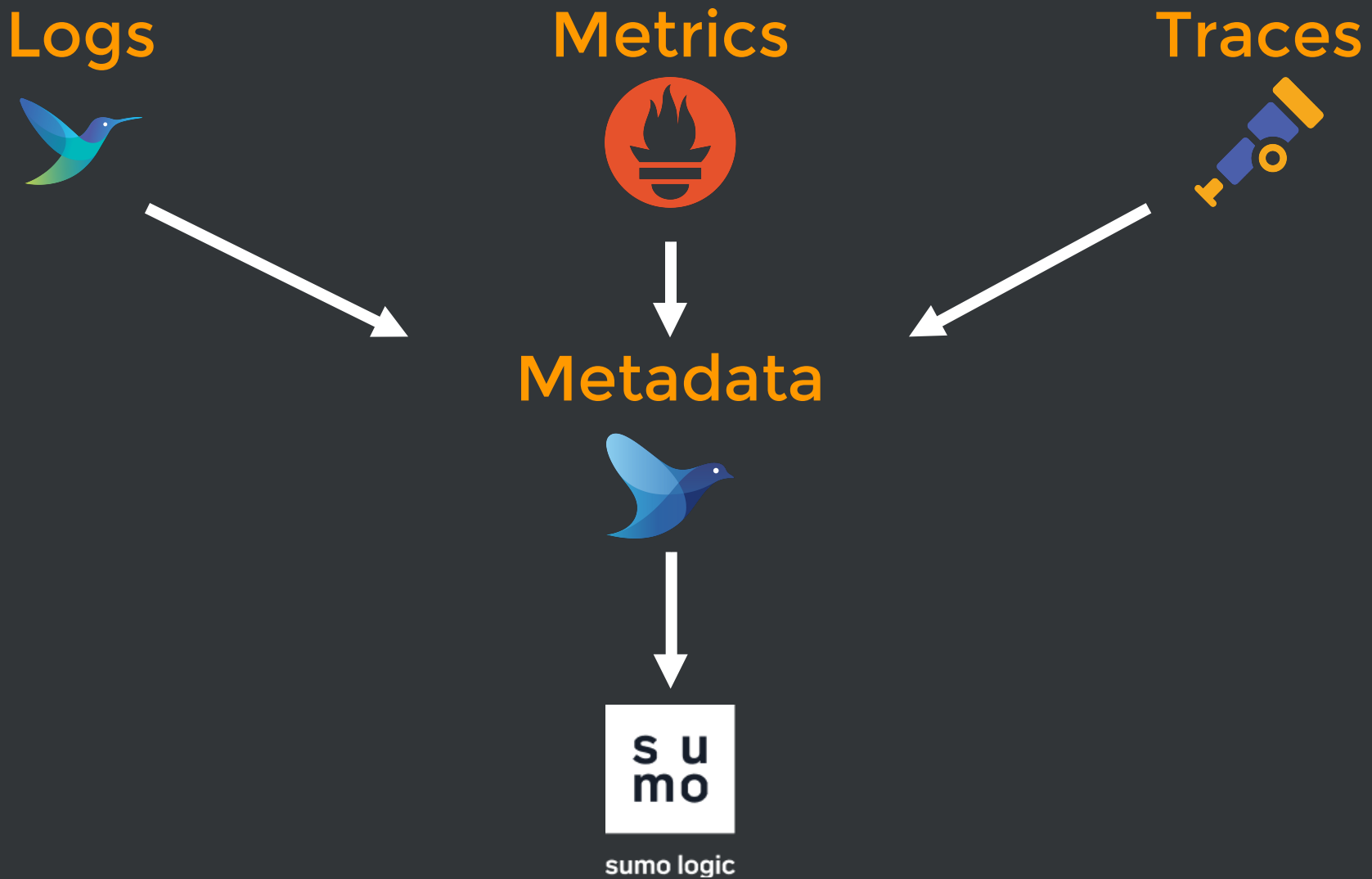
Contrib distribution

https://github.com/open-telemetry/opentelemetry-collector-contrib - components

Custom distributions

- Grafana Agent
- Sumo Logic
- ADOT (AWS)
- ...

K8s observability



K8s observability

Traces

Metadata

Logs

Metrics

K8s observability

Traces

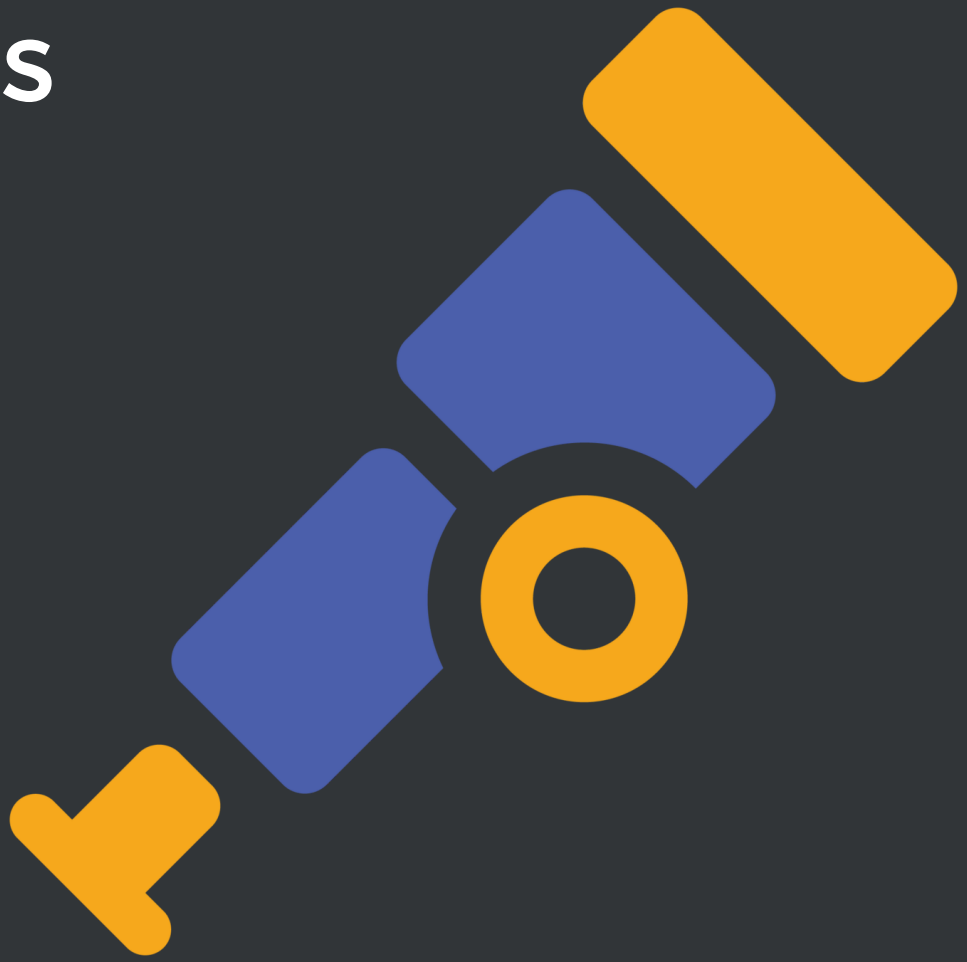
Metadata

Logs

Metrics

Traces

~March 2020




data
flood

K8s observability

Traces

Metadata

Logs

Metrics

K8s observability

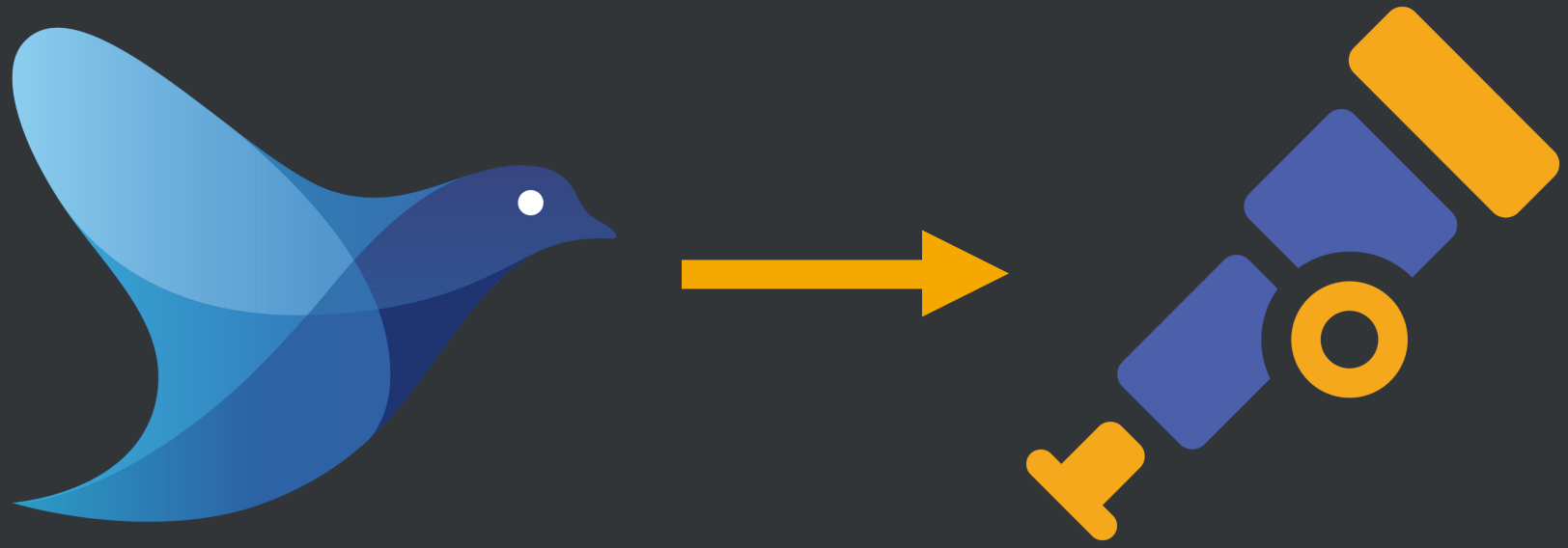
Traces

Metadata

Logs

Metrics

Metadata



Metadata

February 2022

Battle tested

Single threaded

Weak performance

Ruby magic

Metadata

February 2022

Battle tested

Single threaded

Weak performance

Ruby magic

K8s Attributes in beta

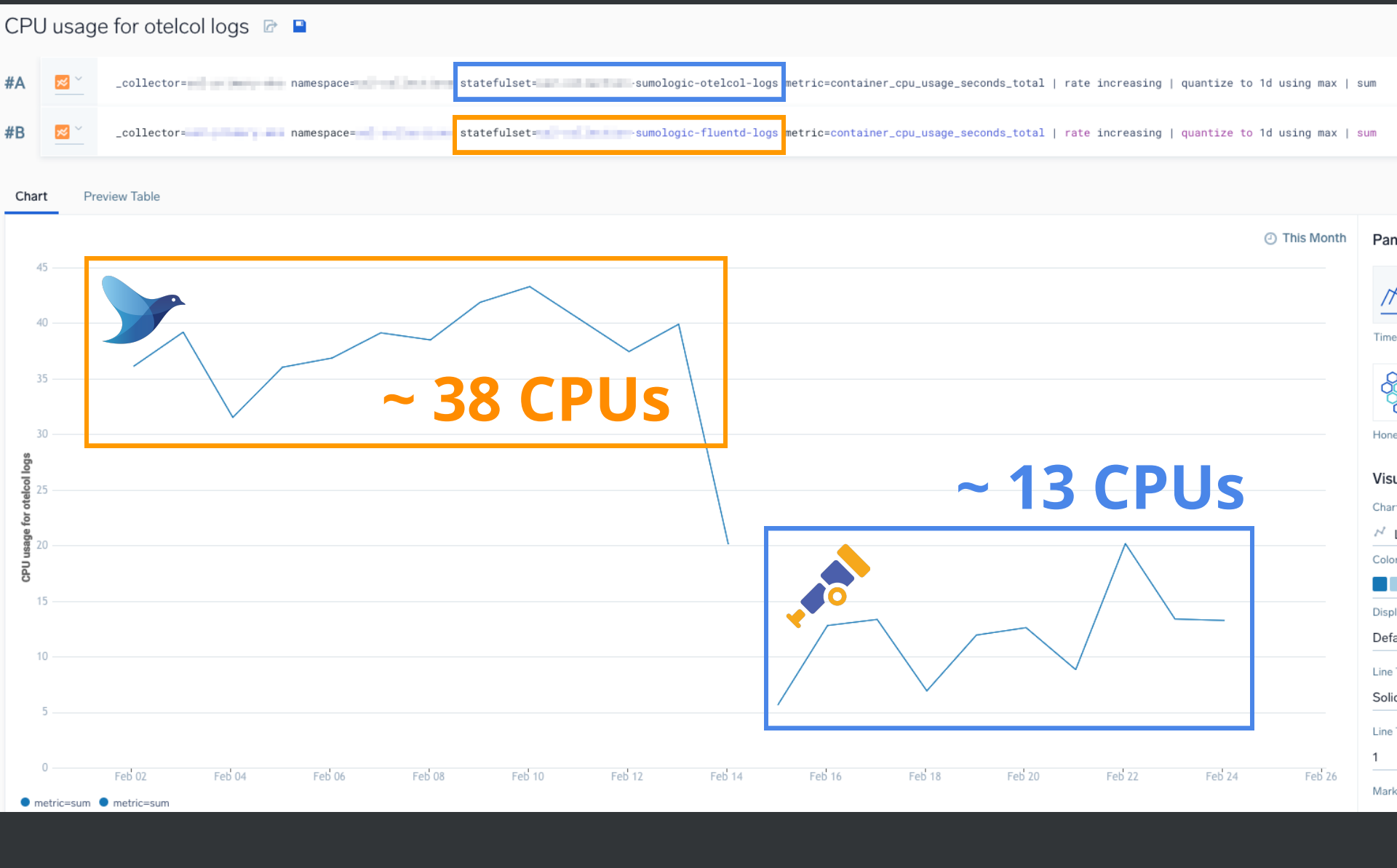
Go-lang performance

Removed backpressure from Prometheus' remote-write

Lowered Prometheus' memory

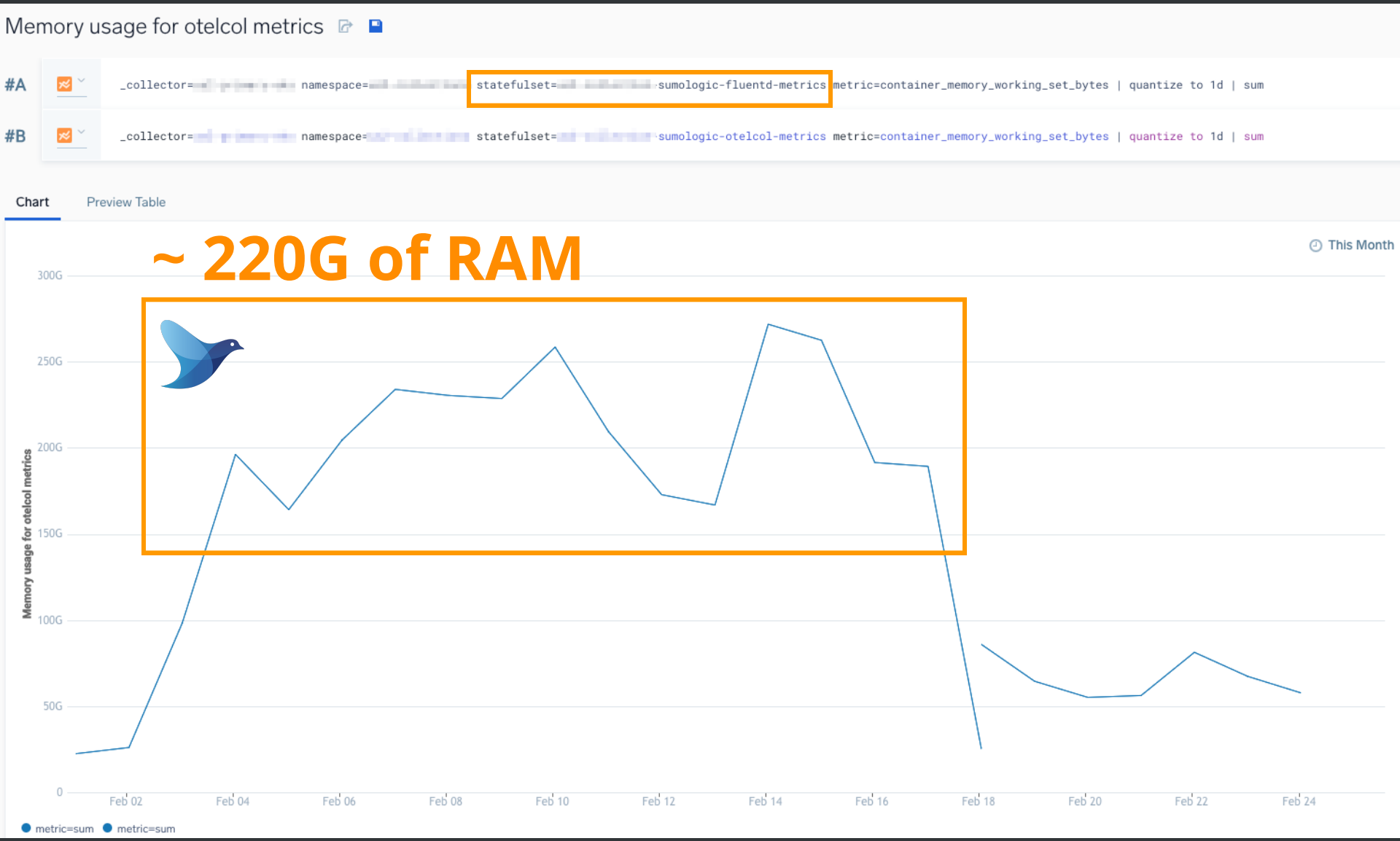
Metadata: CPU sum

Metadata: CPU sum

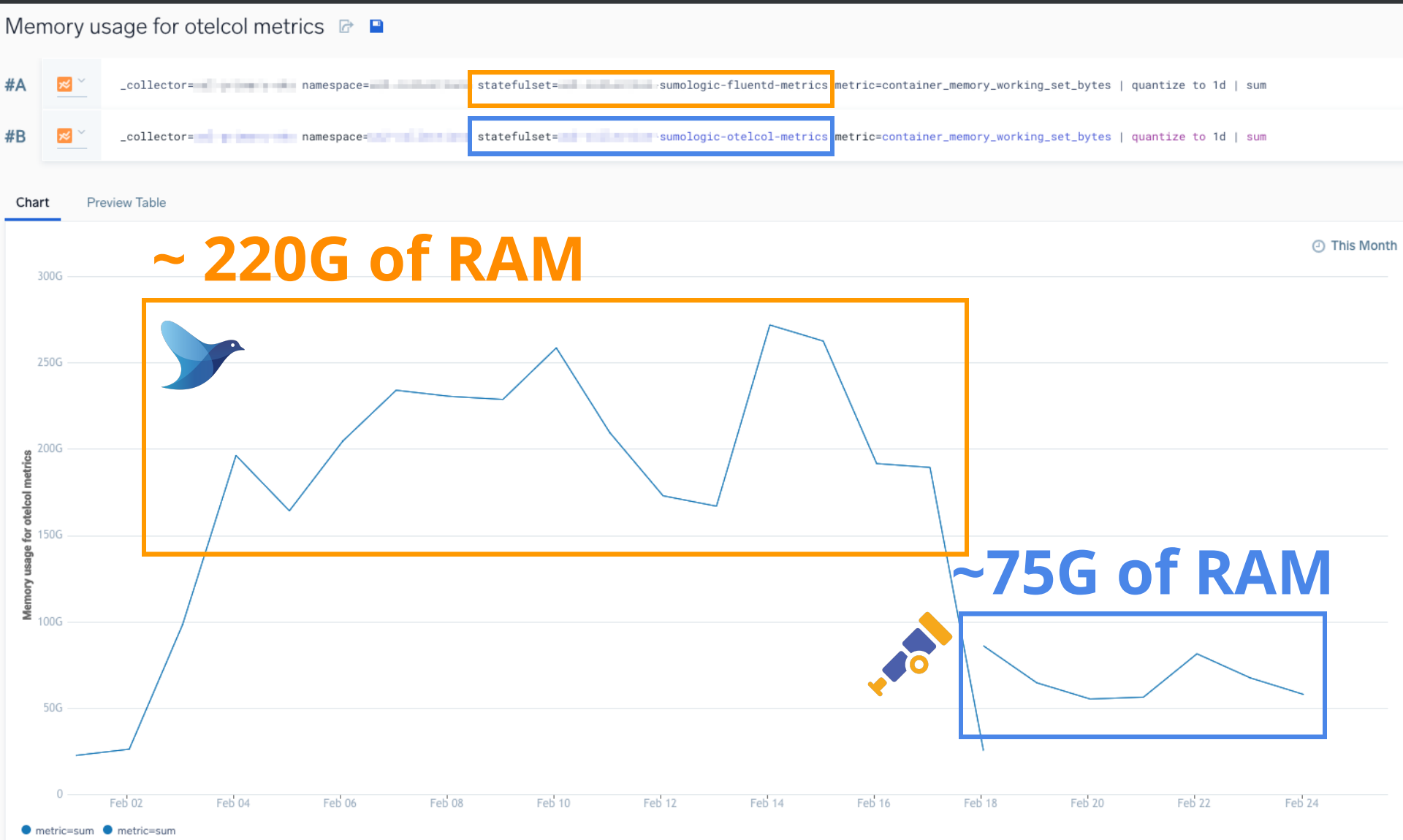


Metadata: CPU sum

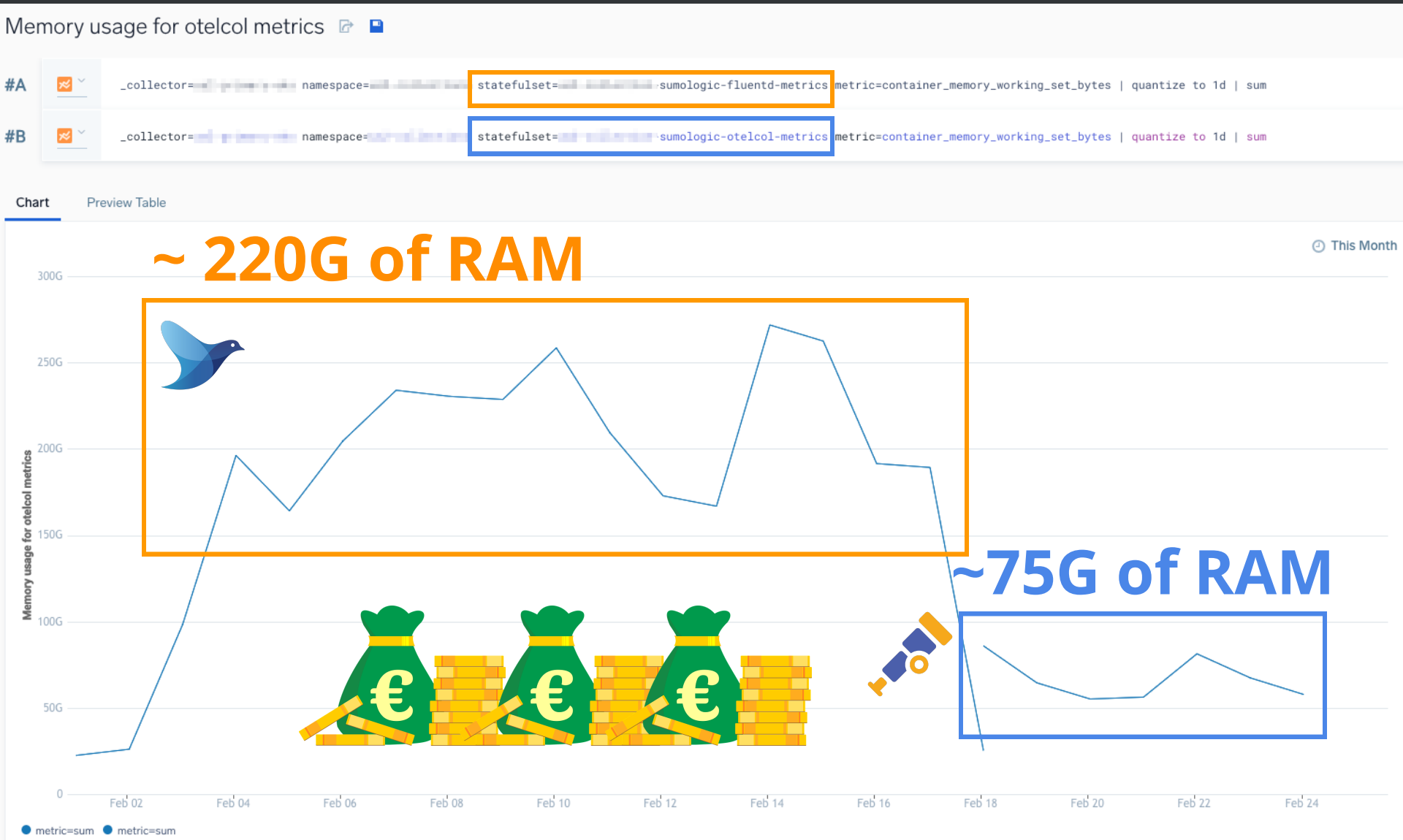
Metadata: memory sum



Metadata: memory sum

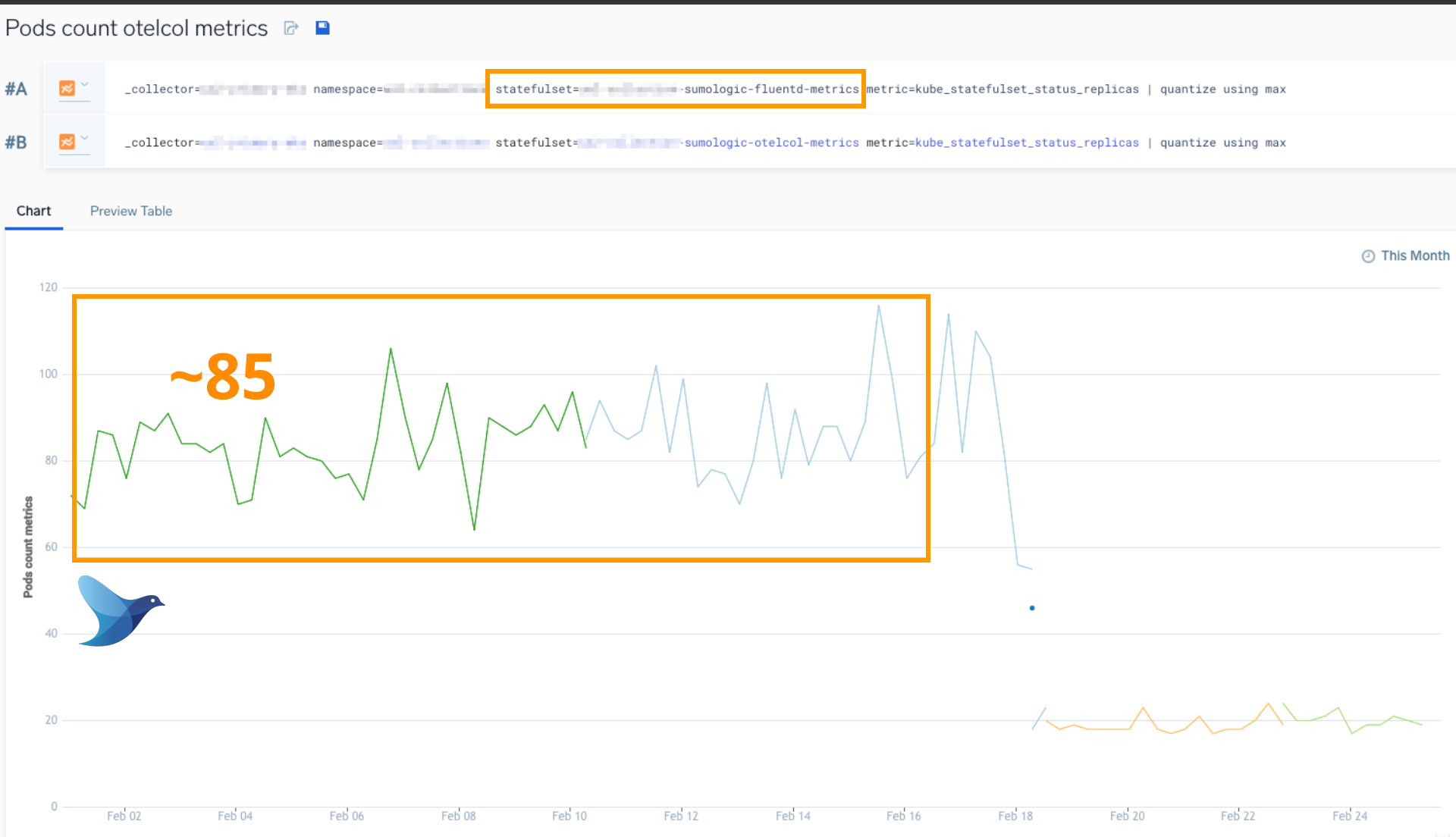


Metadata: memory sum

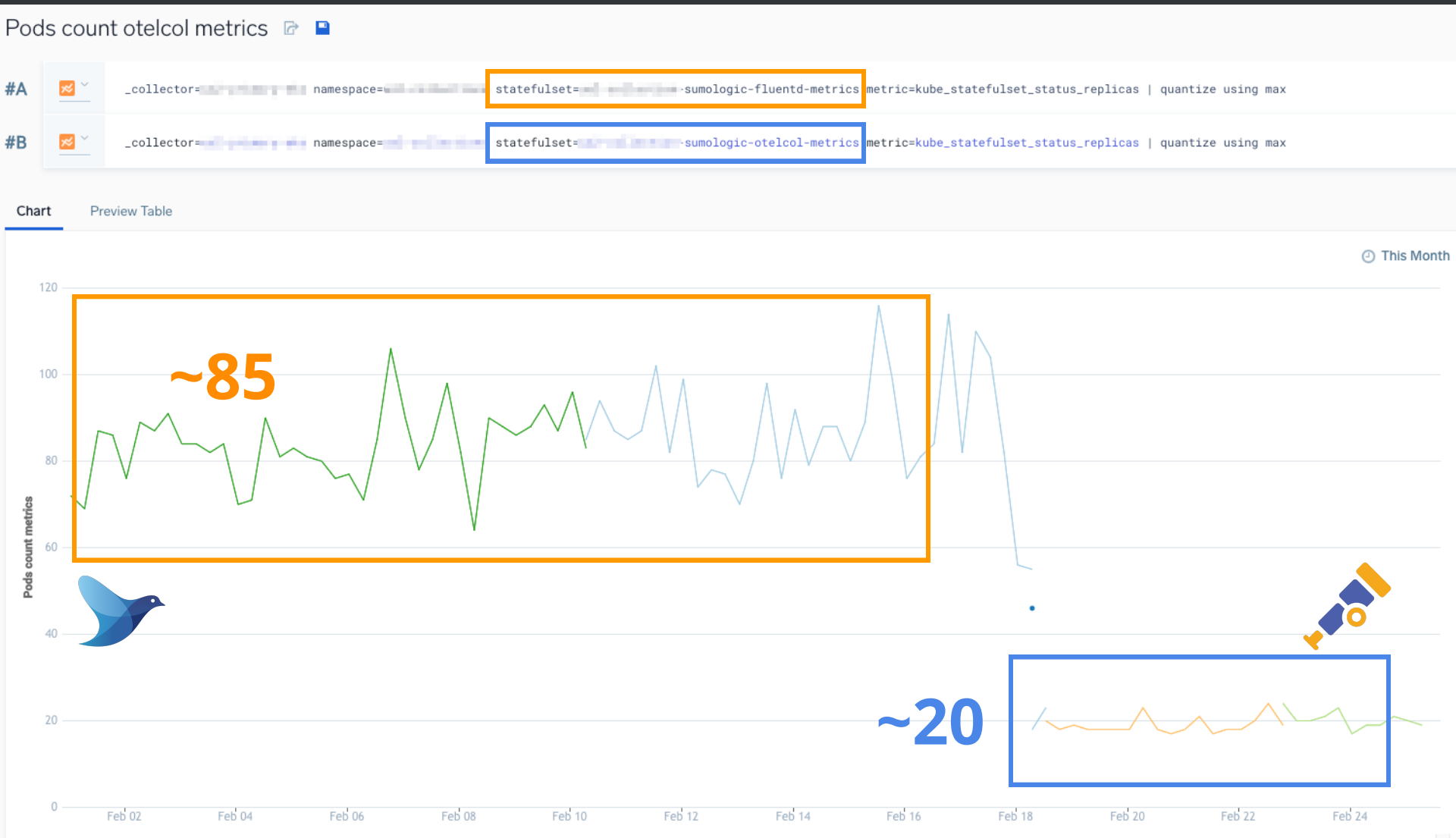


… memory after more tweaks?

Metadata: instances



Metadata: instances



… instances after more tweaks?

… instances after more tweaks?

Pods count otelcol metrics

#A

```
_collector=[redacted] namespace = [redacted] statefulset = [redacted]-sumologic-otelcol-metrics metric=kube_statefulset_status_replicas | quantize using max
```

Chart | Time Series

7 matching time series

18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

May 10 May 11 May 12 May 13 May 14 May 15 May 16 May 17 May 18 May 19 May 20 May 21 May 22 May 23

K8s observability

Traces

Metadata

Logs

Metrics

K8s observability

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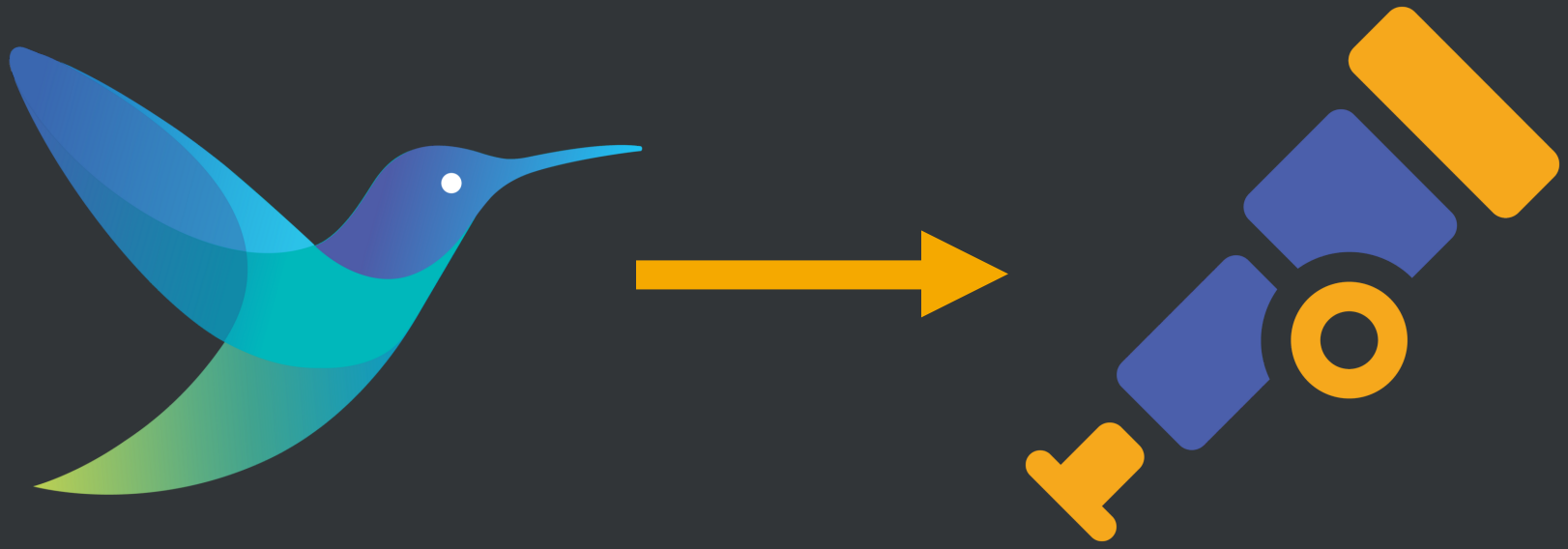

Logs

June 2022

Great CPU usage

Great memory usage

Hard to debug issues

Didn't support metrics and traces at the time (it does now)

Logs

June 2022

Great CPU usage

Great memory usage

Hard to debug issues

Didn't support metrics and traces at the time (it does now)

Filelog Receiver in beta

Great CPU usage

Reasonable memory usage

No major feature missing

K8s observability

Traces

Metadata

Logs

Metrics

K8s observability

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Metadata

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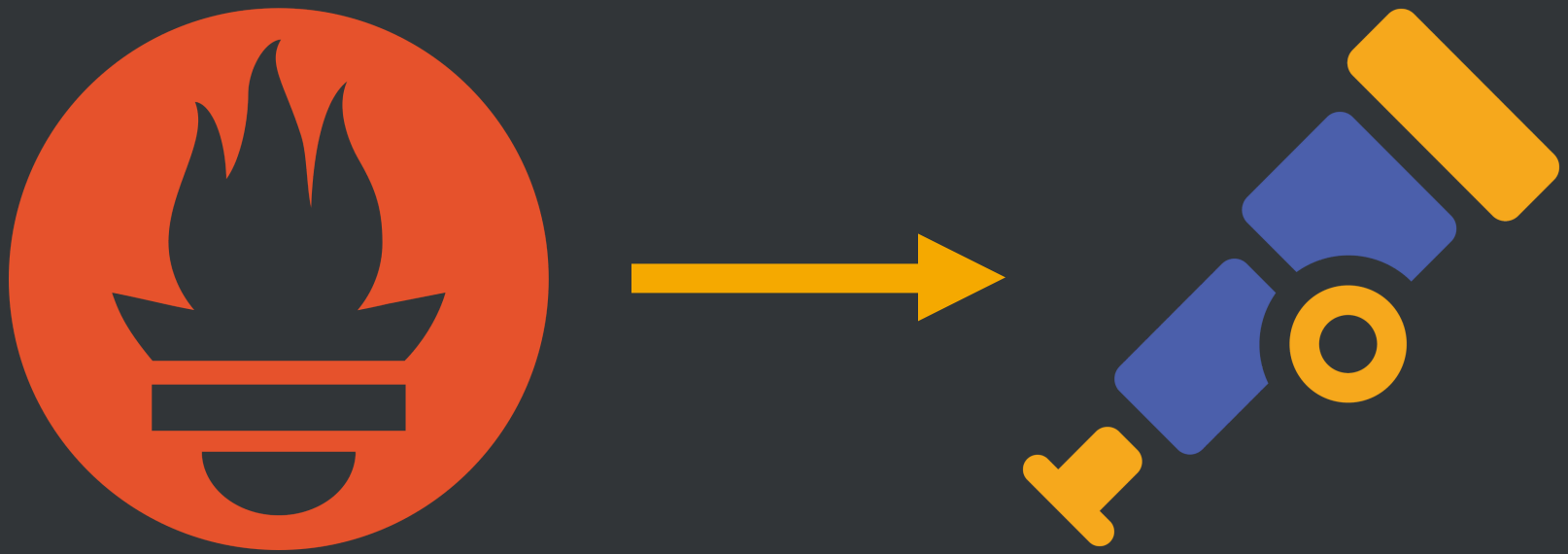
Metrics



Metrics

September 2023

Remote write

Load balancing

Memory usage

Metrics

September 2023

Remote write

Load balancing

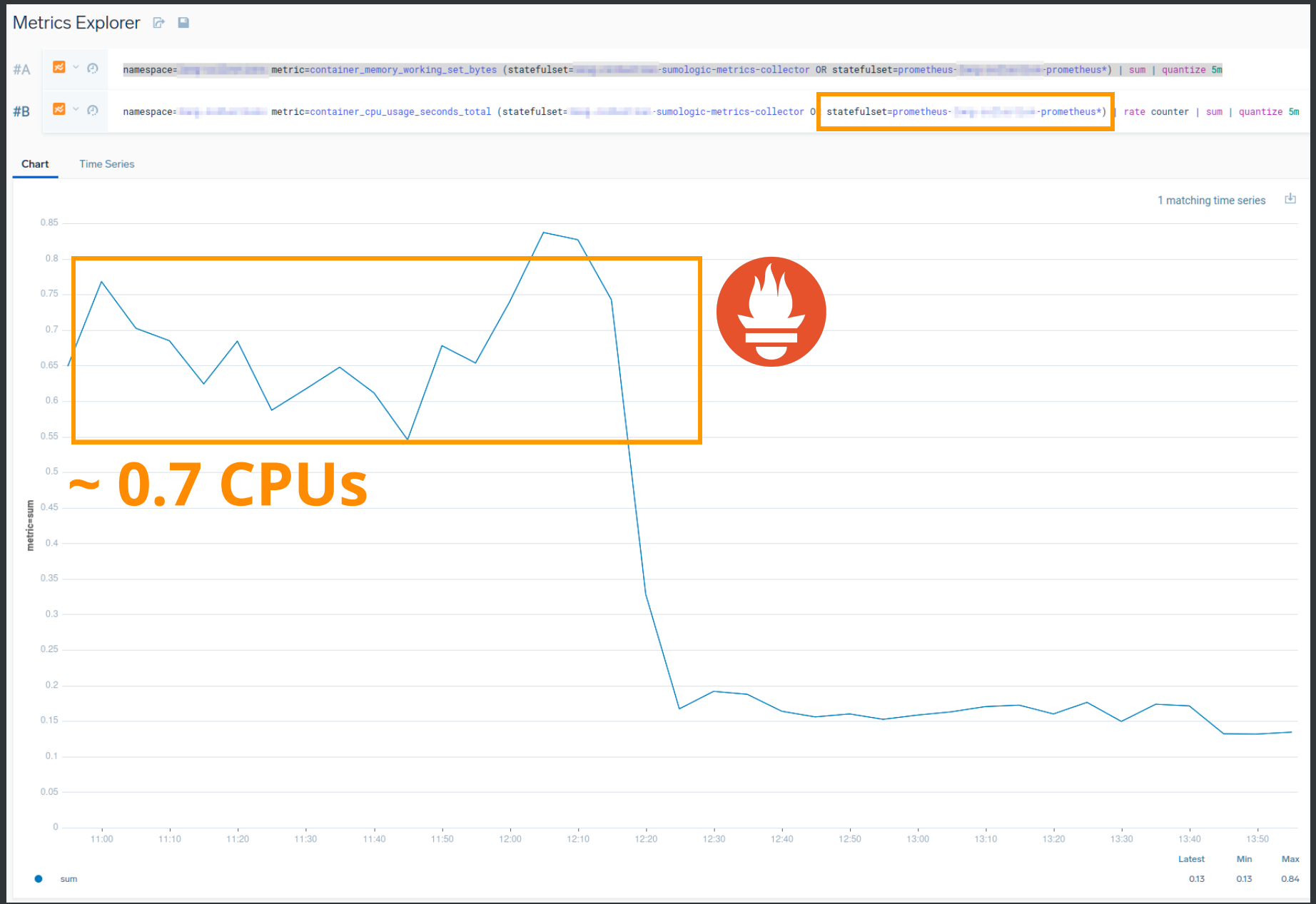
Memory usage

Prometheus receiver in beta

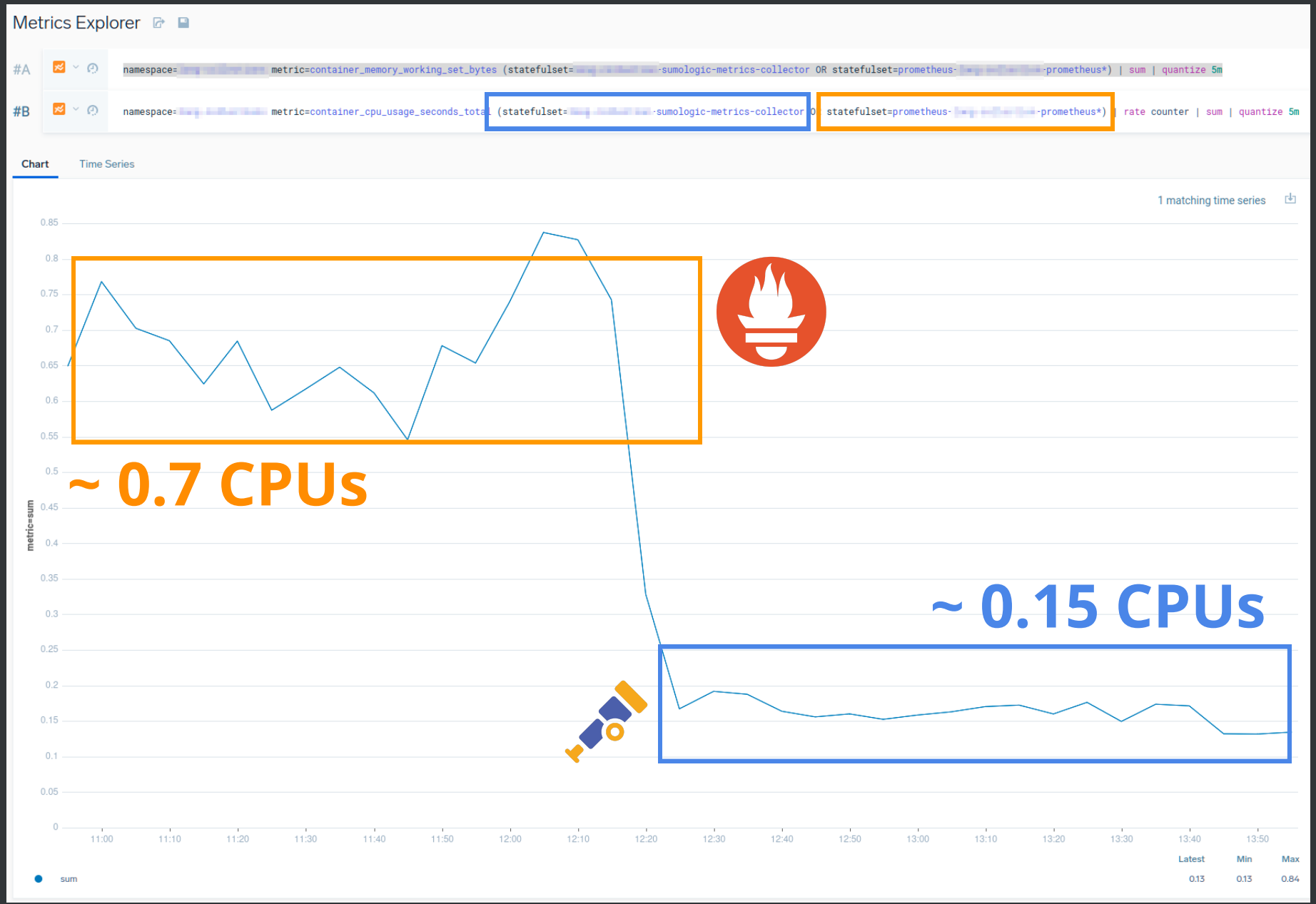
Metric names quirks

Small resource usage

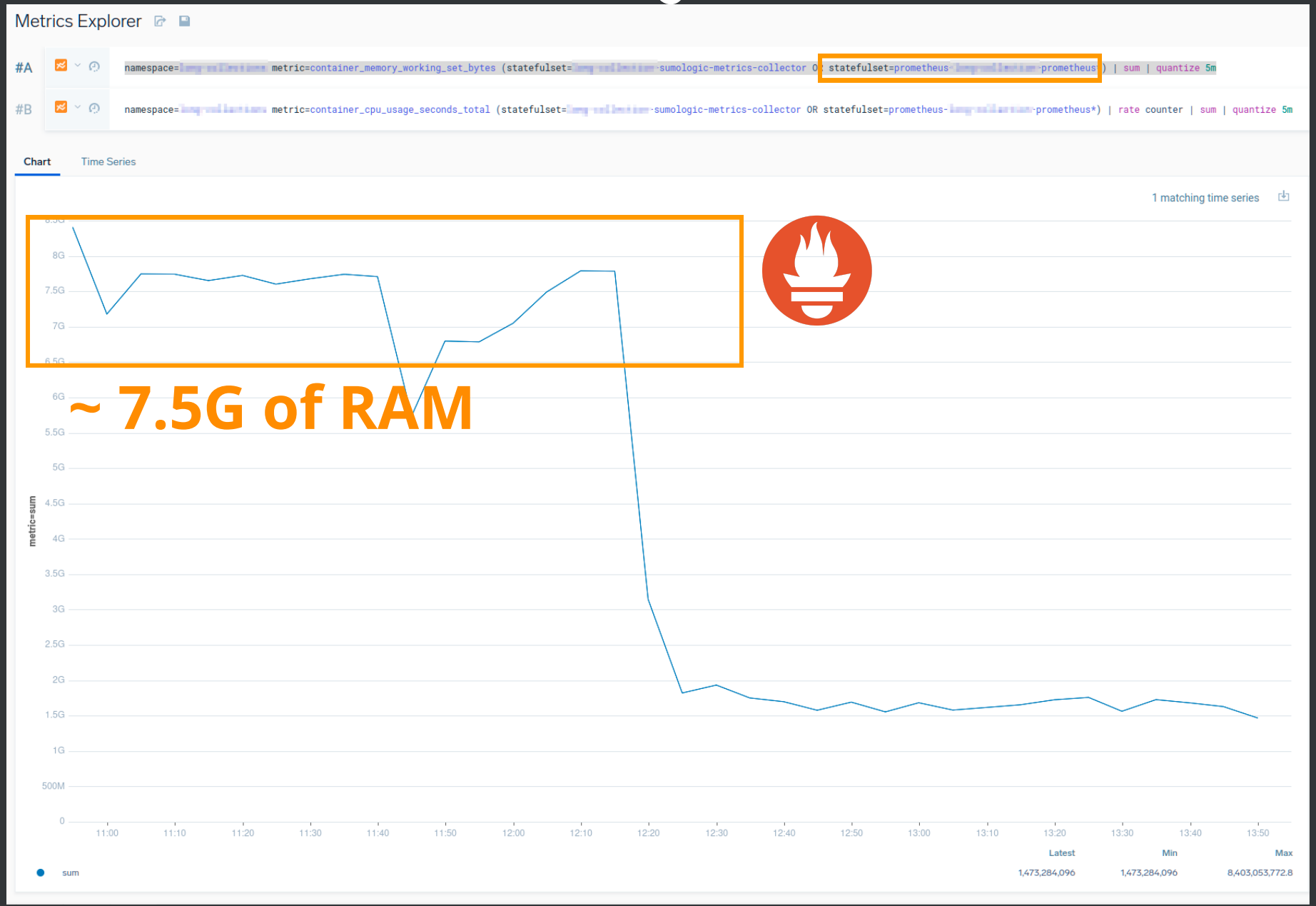
Metrics: CPU sum



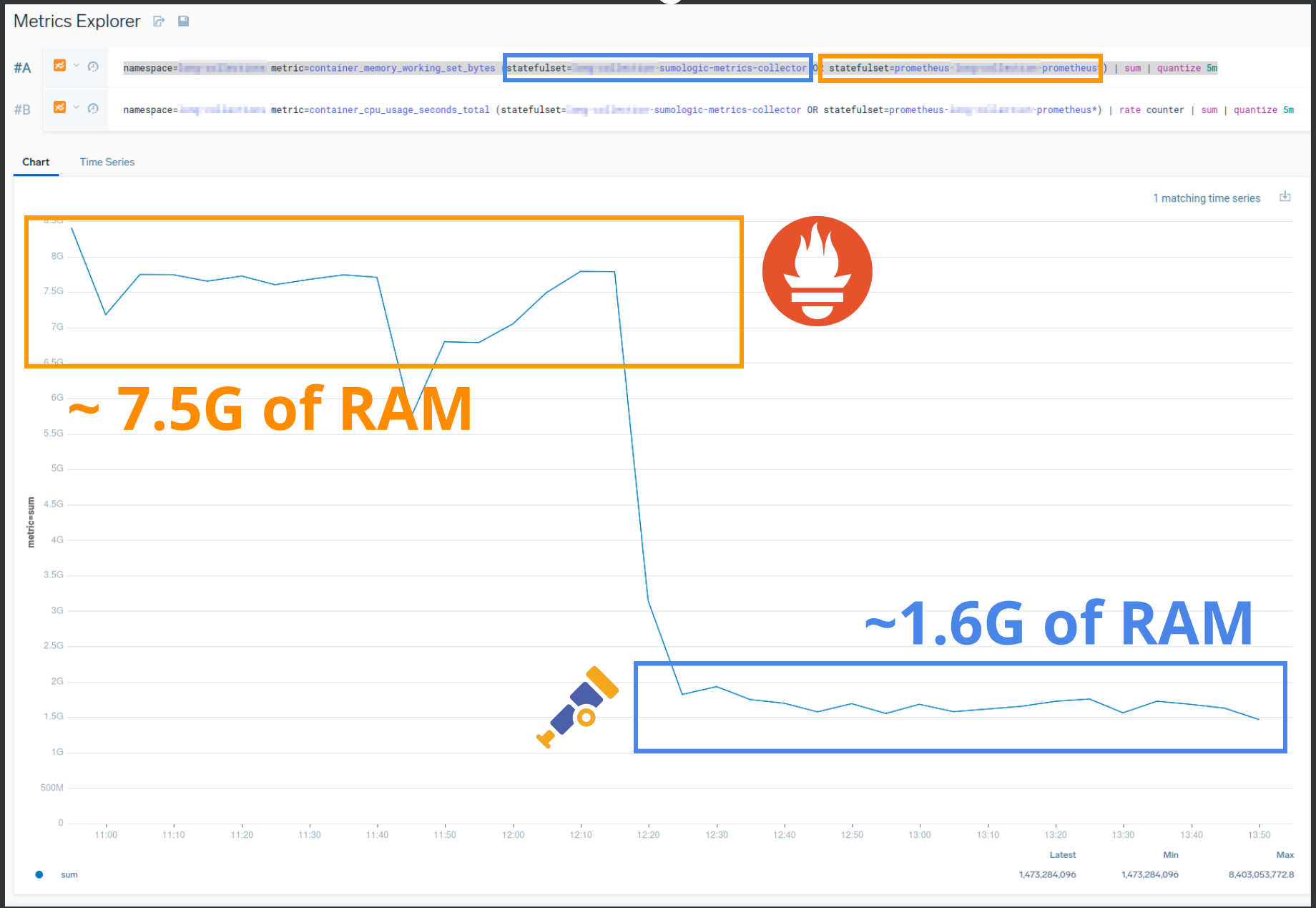
Metrics: CPU sum



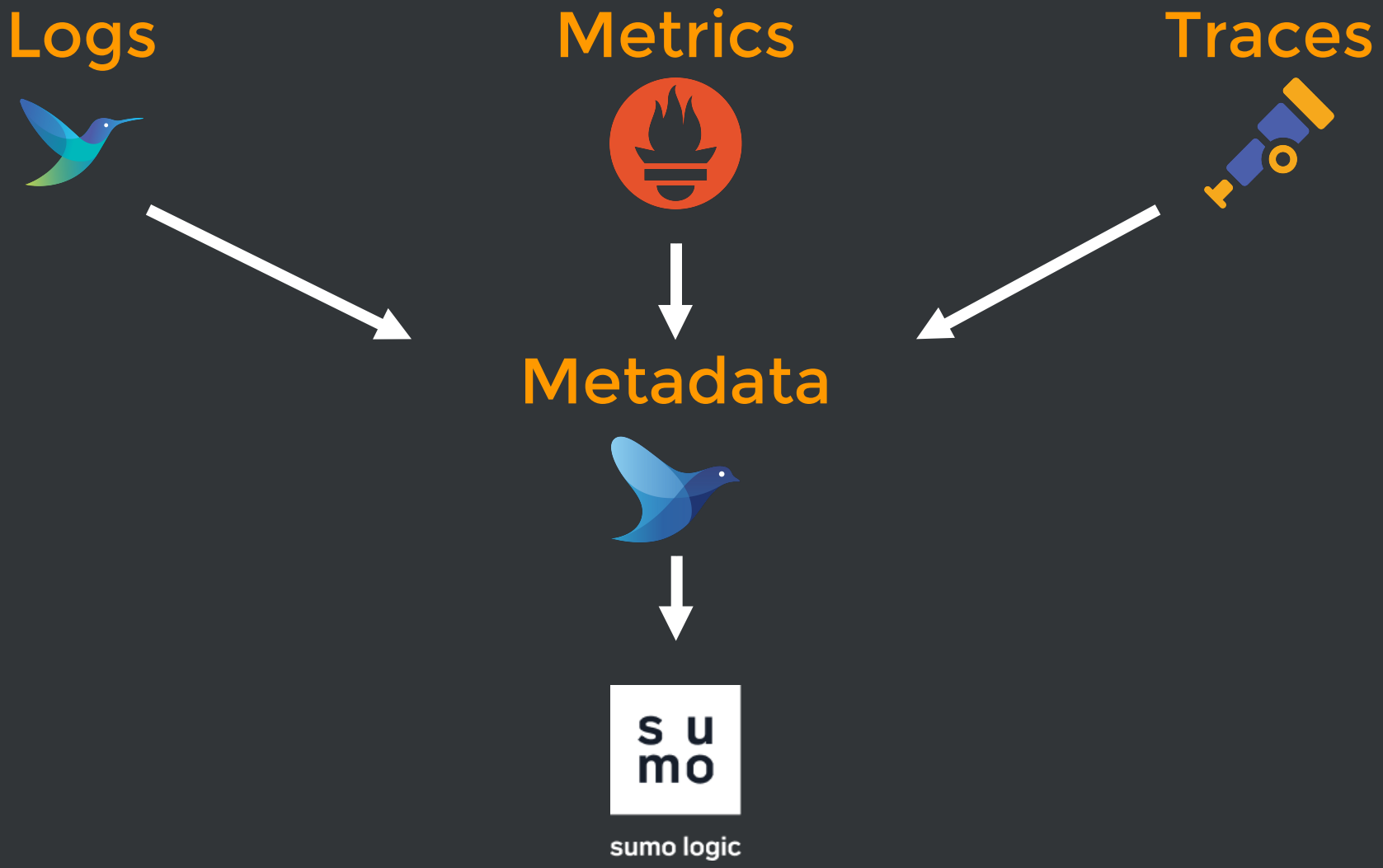
Metrics: memory sum



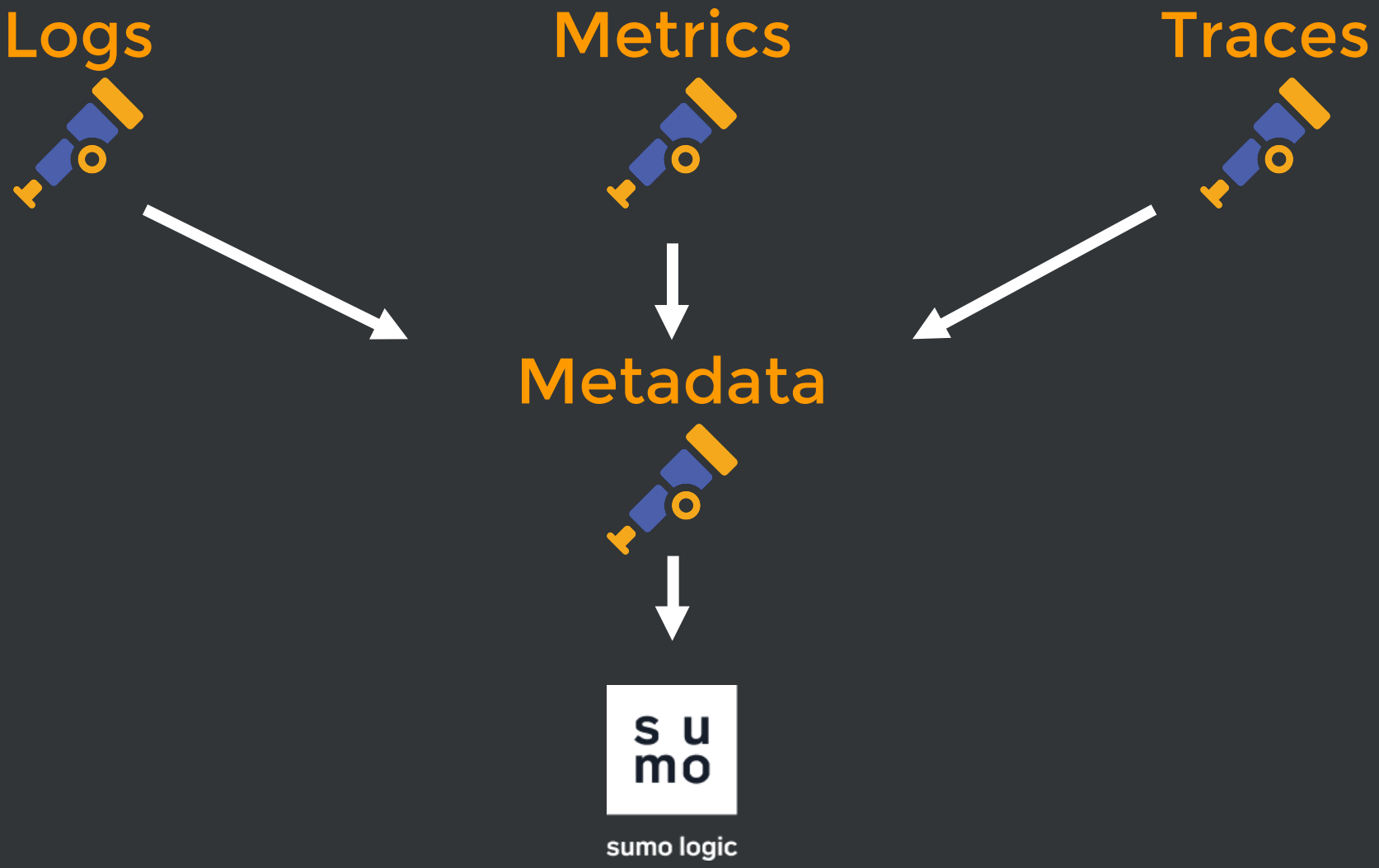
Metrics: memory sum



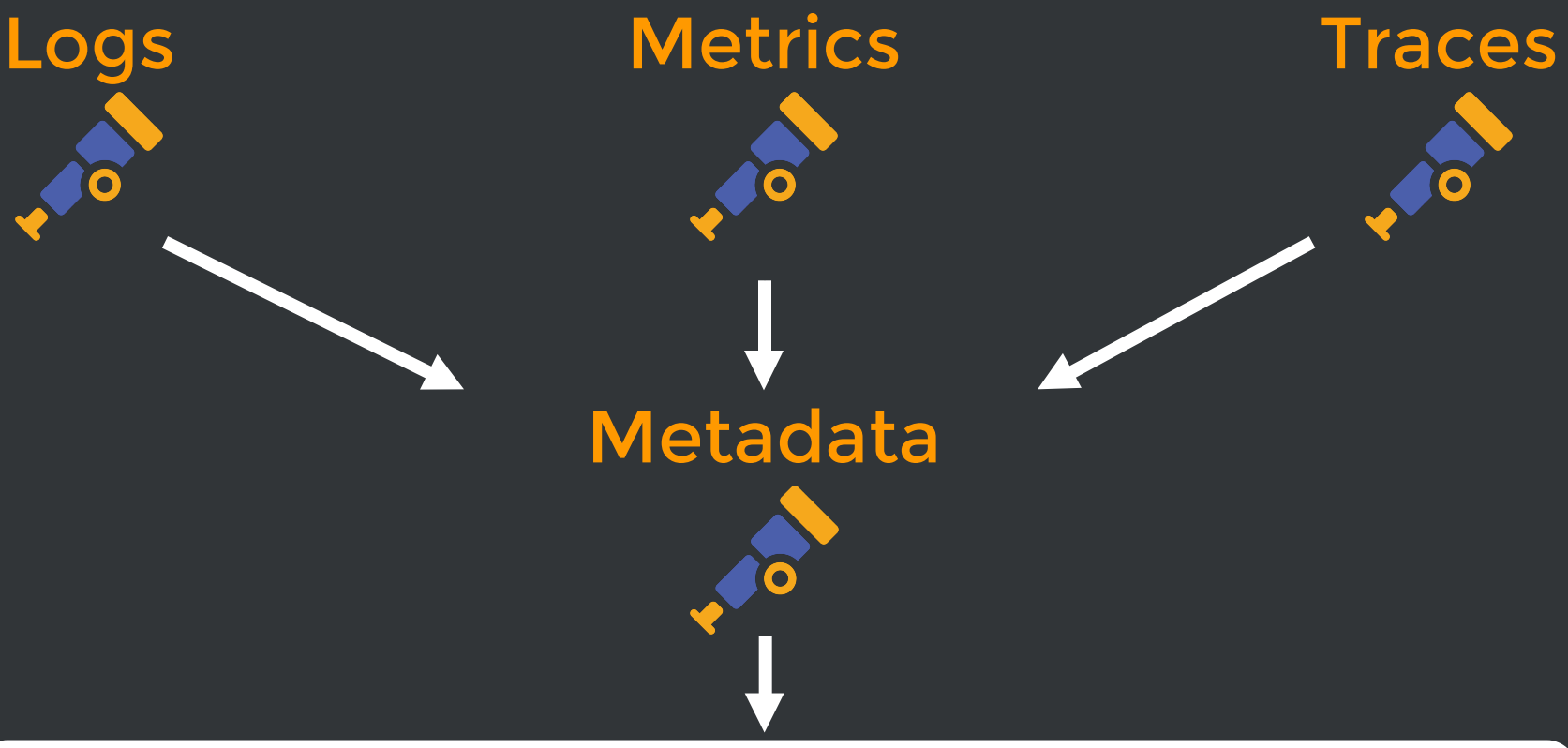
K8s observability - OTel edition



K8s observability - OTel edition

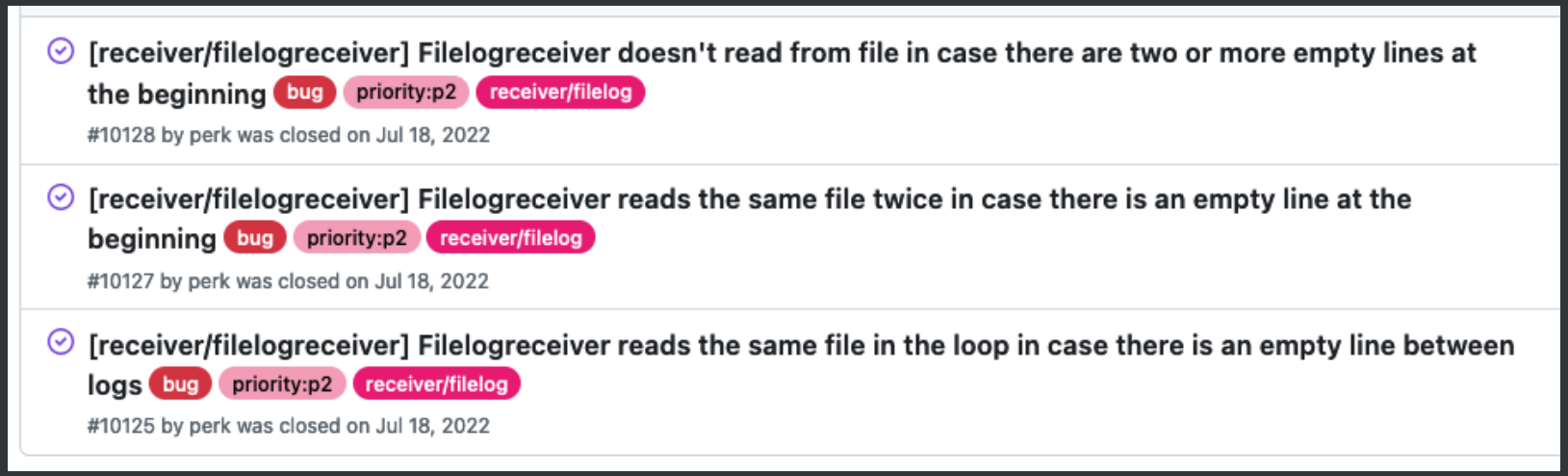


K8s observability - OTel edition

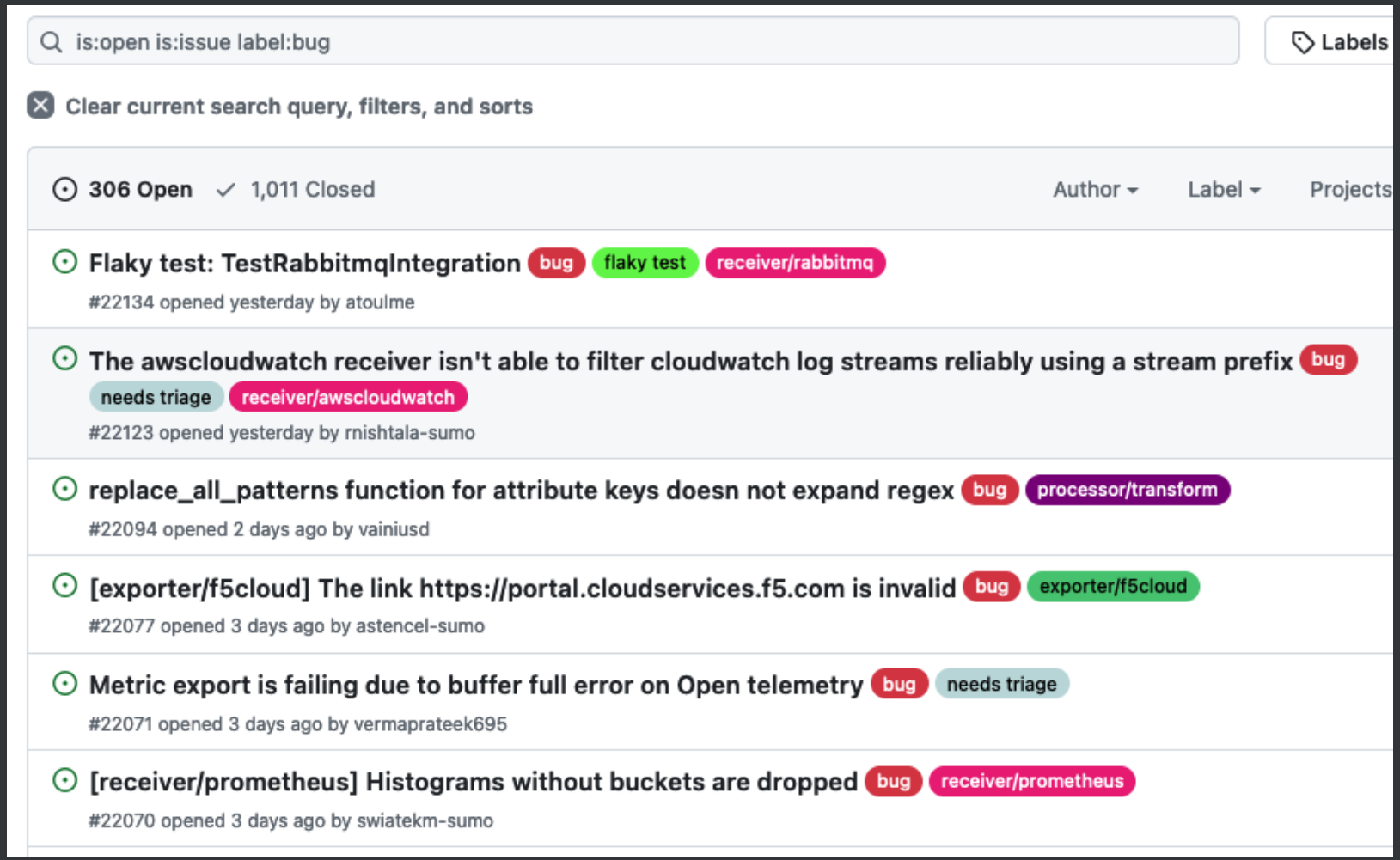


OTC issues

Low hanging ~~fruit~~ bugs in 2022



State as of 2023



Some more #OpenTelemetry

opentelemetry.io

opentelemetry.io/docs/collector

opentelemetry.io/community

Community

- OpenTelemetry org at GitHub
- Mailing lists
- GitHub discussions or Slack channel
- Calendar
- Community page

Thank you!

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slides.com/perk/journey-to-opentelemetry-collector