

Tech Talks

Exploring Kubernetes Observability with OpenTelemetry



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Martin Nirtl

Solutions Architect

I am an IT engineer 🤖 with strong backgrounds in software, DevOps/platform and electronic engineering working for **Mirantis** as a pre-sales solution architect. Next to my job, my main side-hustles are all around Kubernetes 🛥, IaC and automating things. From time to time, I even build little apps in Go or other languages.



[martinnirtl](#)



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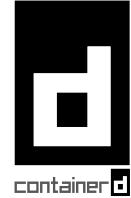
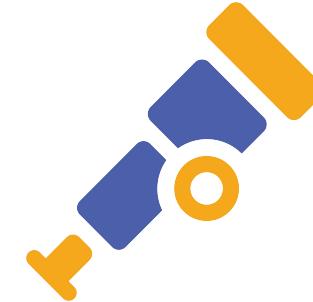


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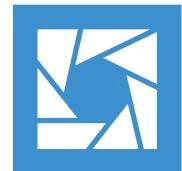


What are we going to explore today?

- Observability Intro
- The OpenTelemetry Project
- Demos
 - Application Tracing
 - Kubernetes Components Tracing
- Q&A



kubernetes



KCNS

“Observability, don't you see,
Is about understanding the system's degree,
Through its external outputs or behaviors,
It provides insights for troubleshooters and bearers.

Collecting data from various sources is the key,
To gain insights into performance, health, and reliability,
Observability is crucial for efficient monitoring,
And optimization of systems that need fine-tuning.

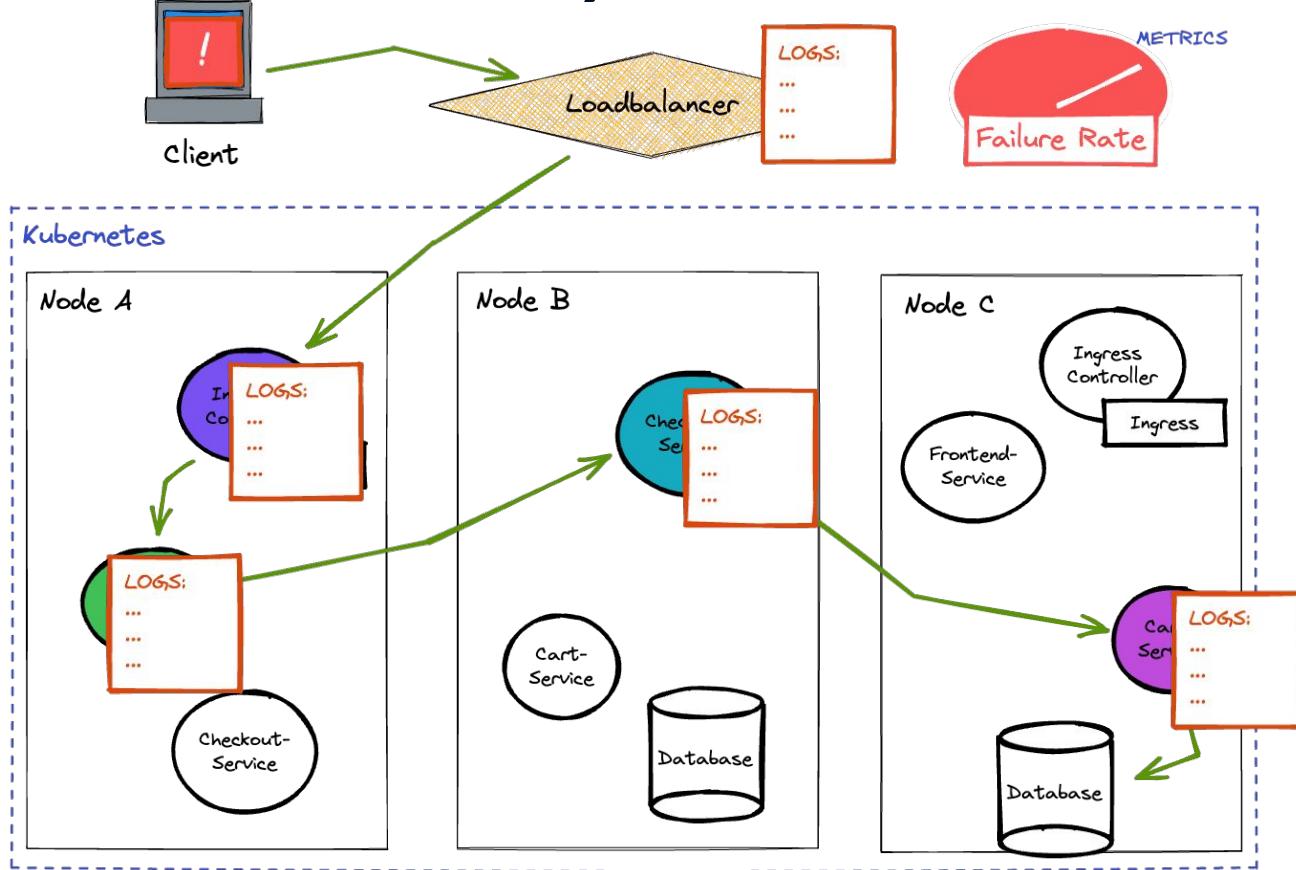
So, if you want to keep your systems running right,
Observability should be in your monitoring sight.”

ChatGPT on Observability

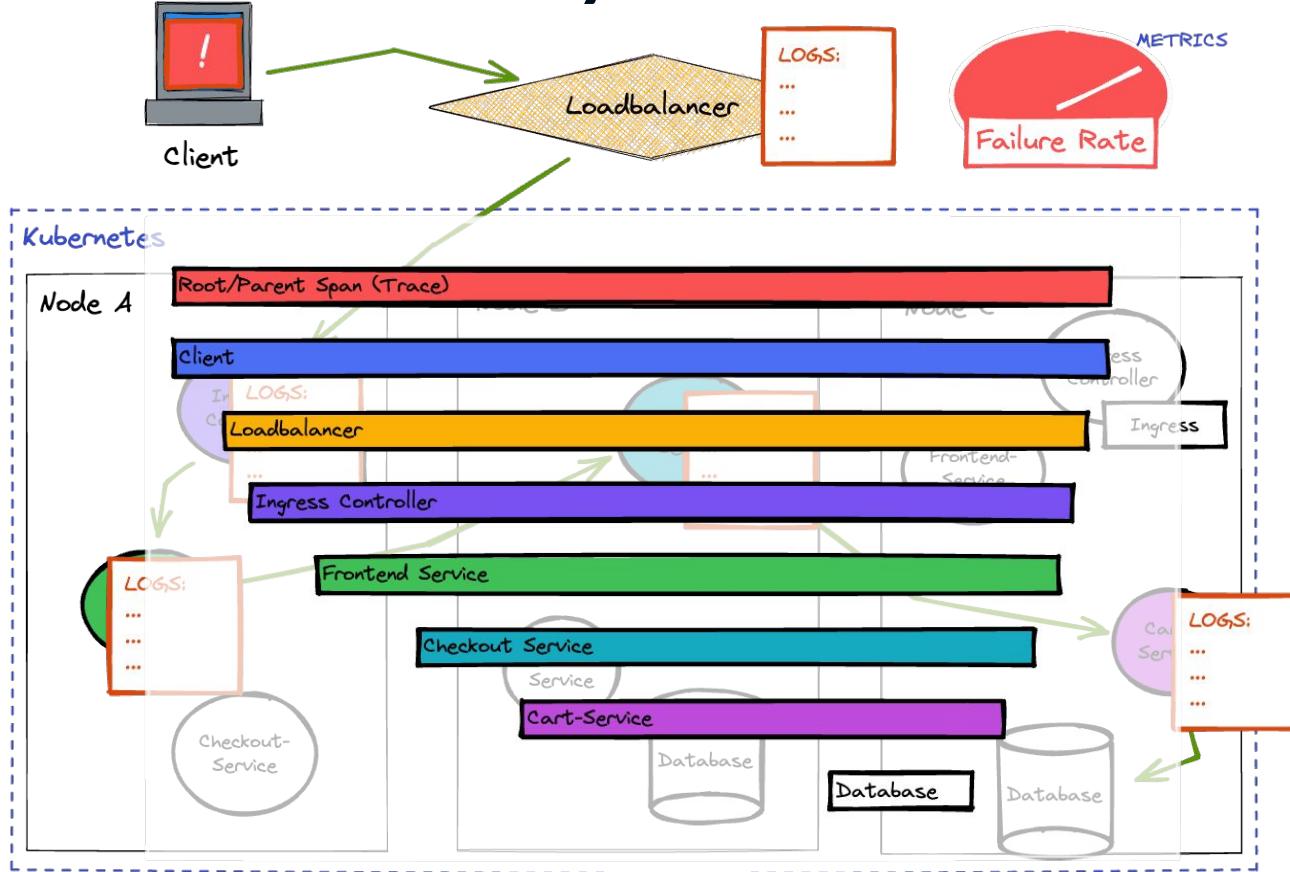
Observability

Get ready for a 5 minute intro  6 min max 

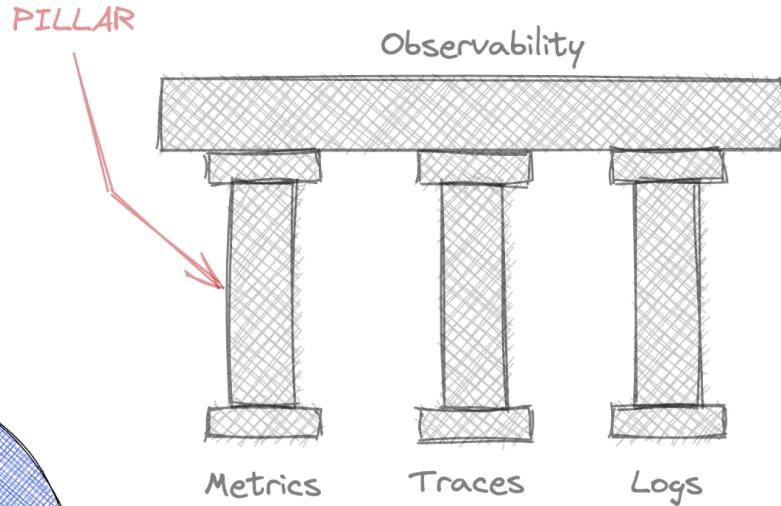
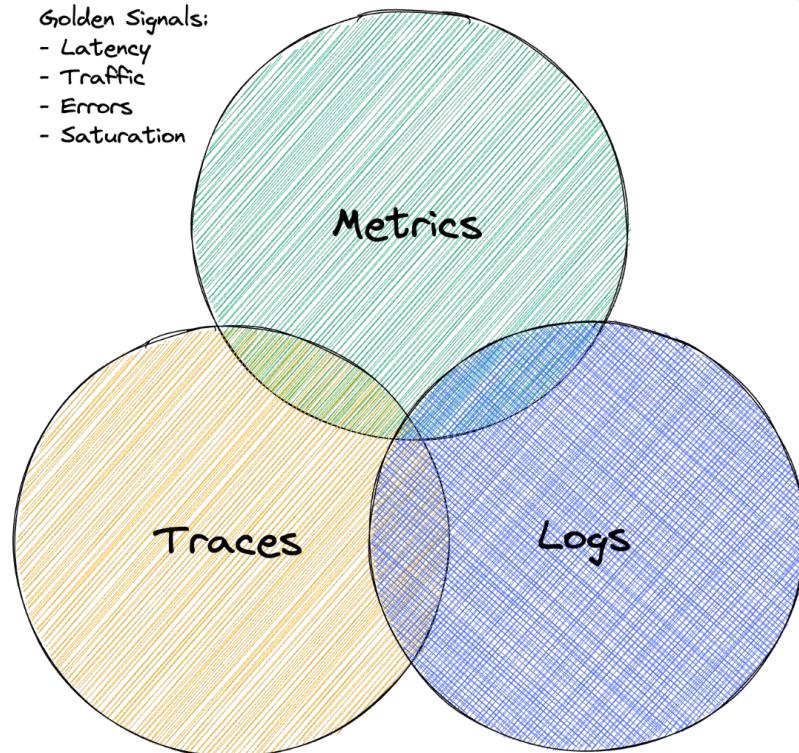
Why do i need Observability and what is it?



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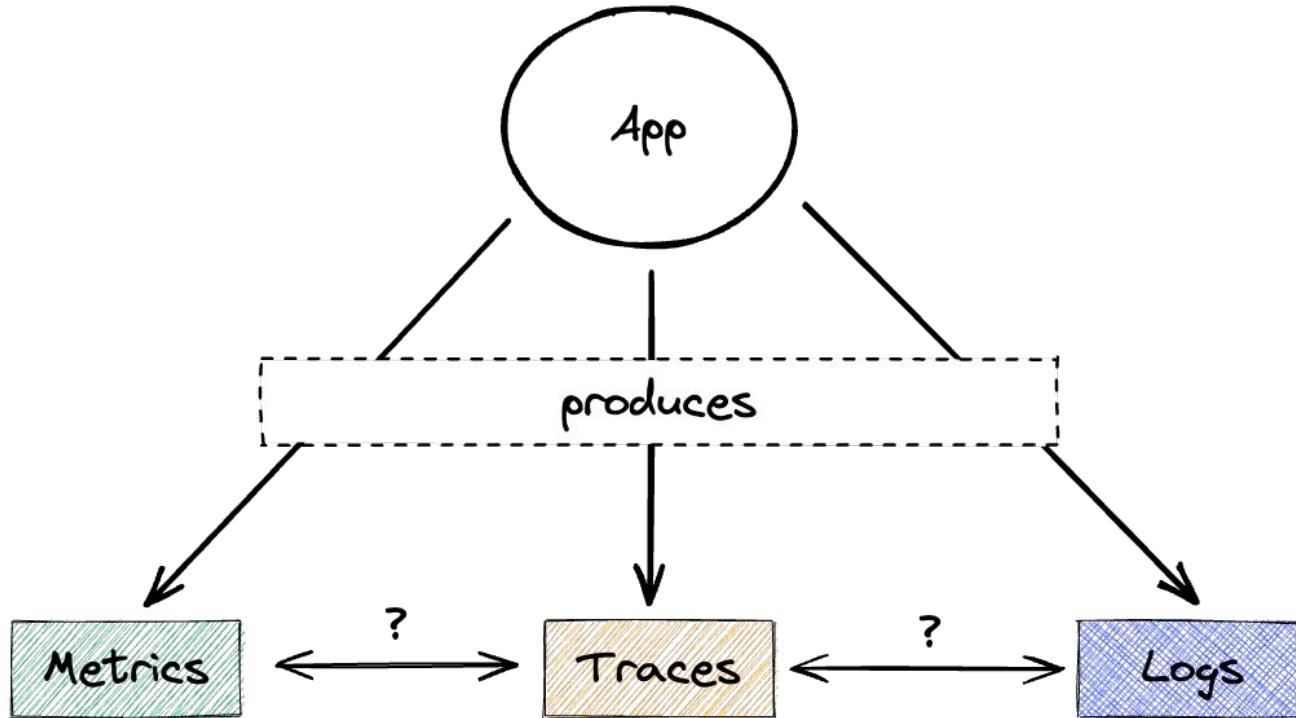
Pillars of Observability



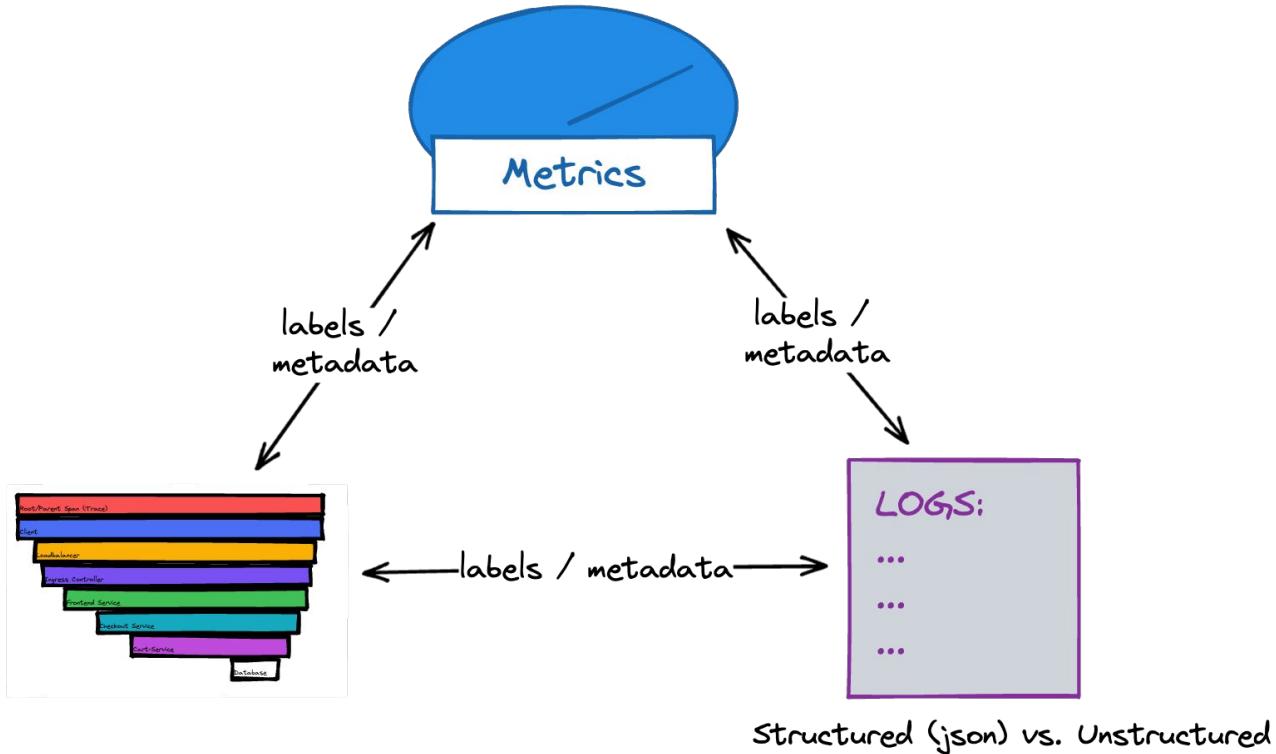
What else can be there?

- Topology information
- Profiling data
- ...

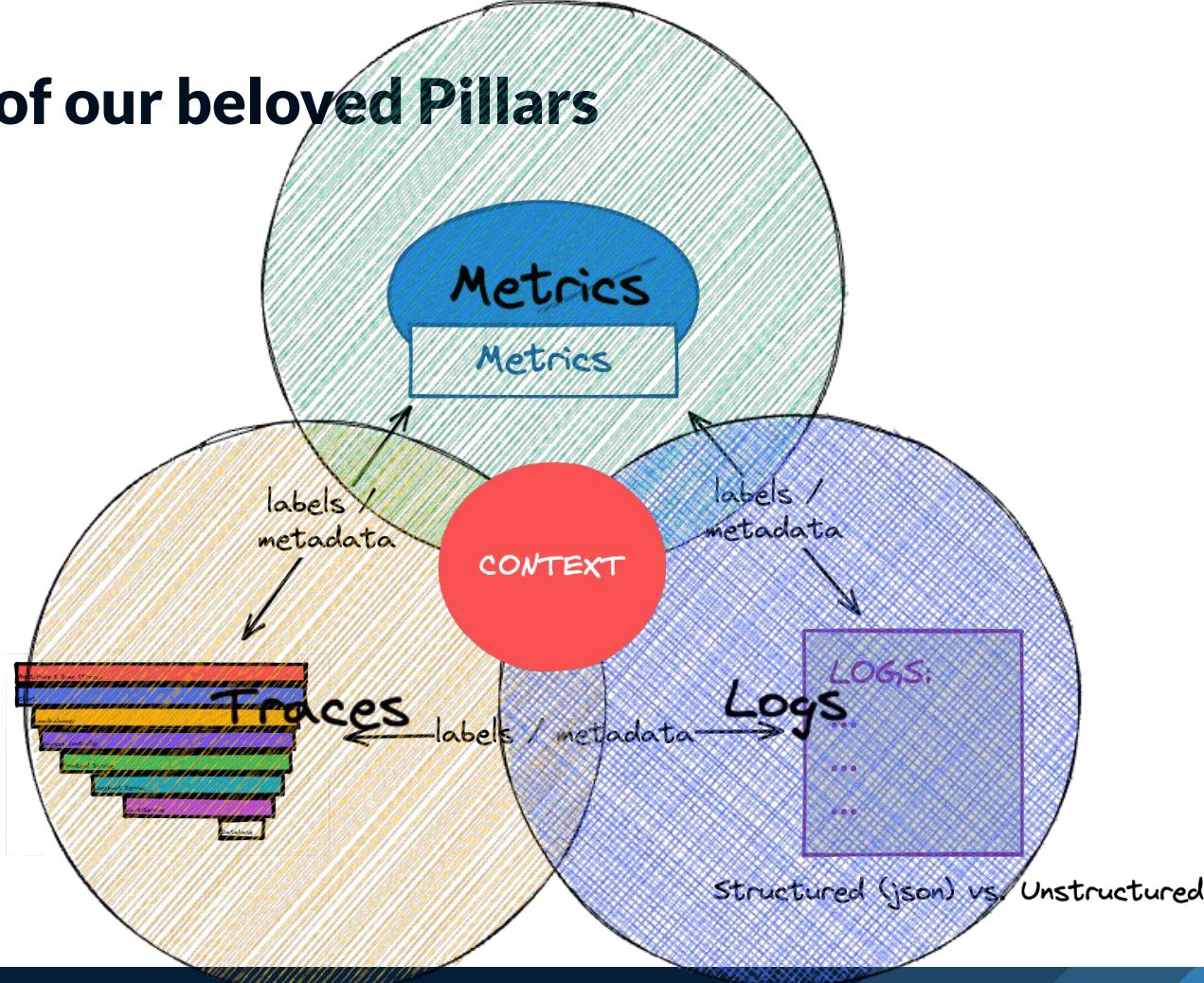
Relation of our beloved Pillars



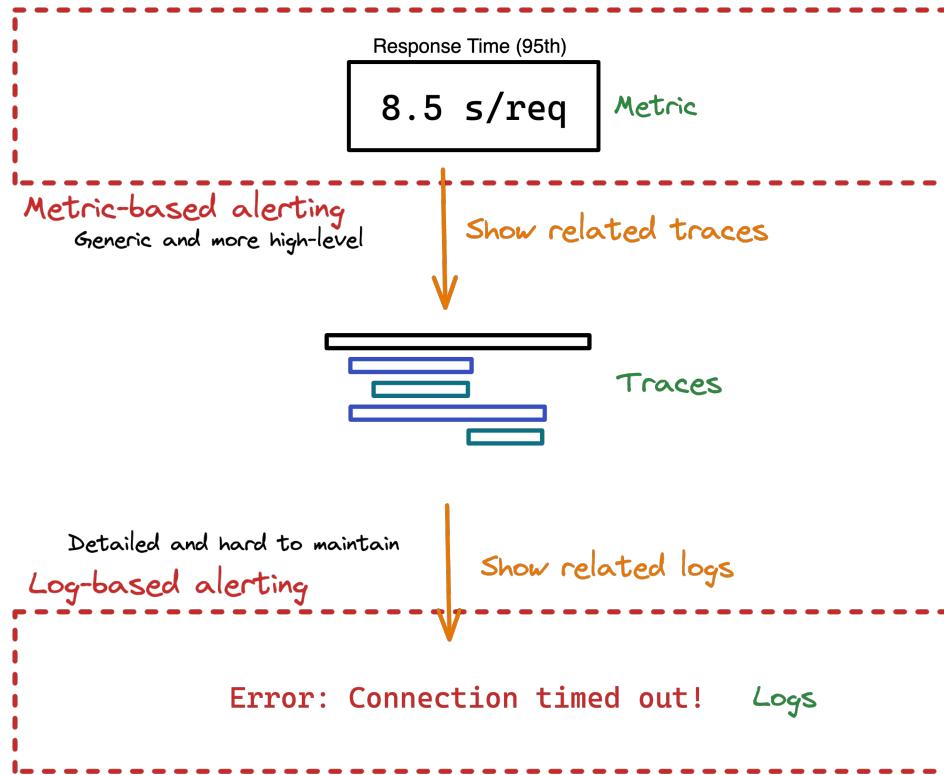
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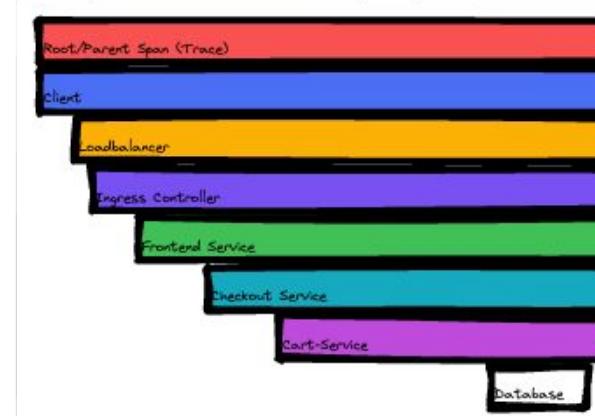


The Value of Context



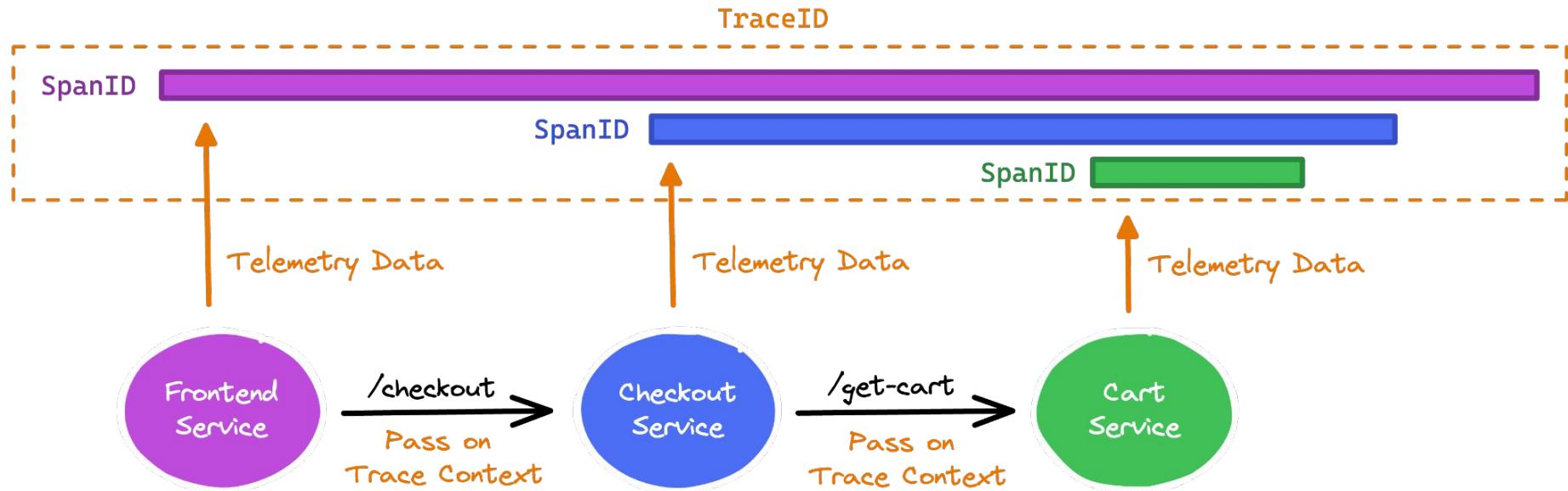
Today's Superstar: Tracing 😊

- Shows **order** and **timing** information
 - Traces are emitted per service (as for metrics and logs)
- **Troubleshooting** and **Performance engineering**
- Basis for **Metric Calculation**
 - (3 of 4 golden signals can be computed from traces)
- Initial focus of **OpenTelemetry** project
- Works with **Context Propagation** ([W3C Trace Context](#))



What is a Trace and how does Tracing work?

Trace Context = Trace ID + Span ID

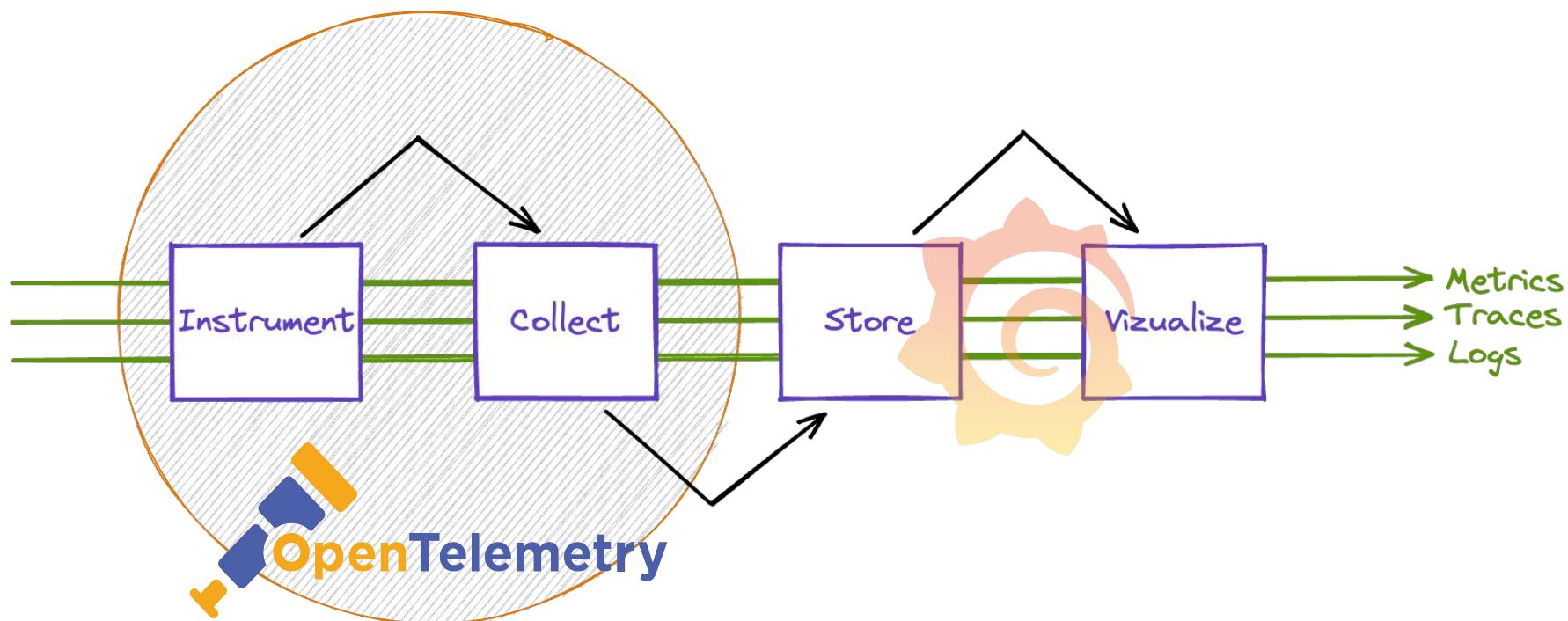




OpenTelemetry

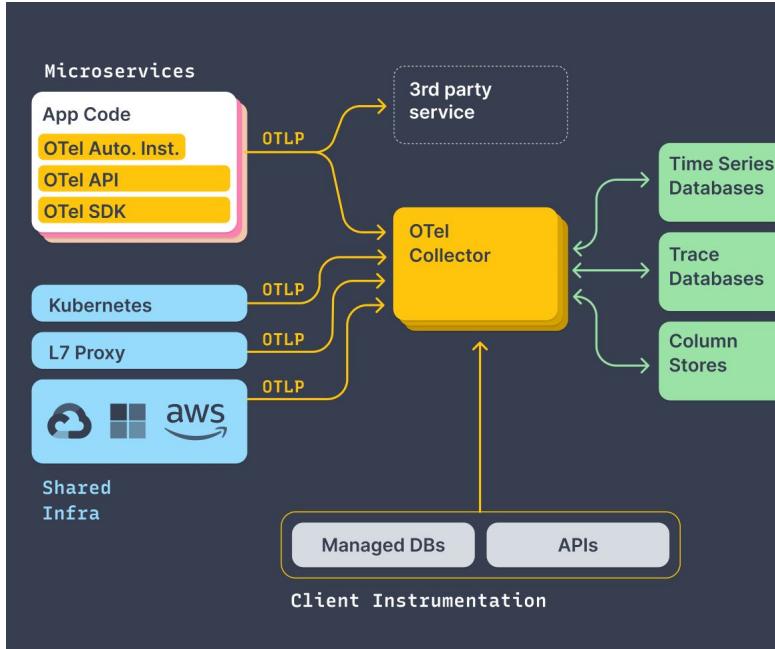
One ring to rule them all A small, stylized diamond or ring emoji is positioned next to the text.

Where does OpenTelemetry fit into the picture?



OpenTelemetry Project

- Open source and vendor neutral
- Collection of tools, APIs and SDKs
 - Stable: Traces and Metrics
- Instrument, generate, collect and export telemetry data
- Merger of OpenTracing and OpenCensus
- CNCF Incubating Project
 - 2nd most-active project after Kubernetes



Source: <https://opentelemetry.io/>

Demos

Show me! 😊

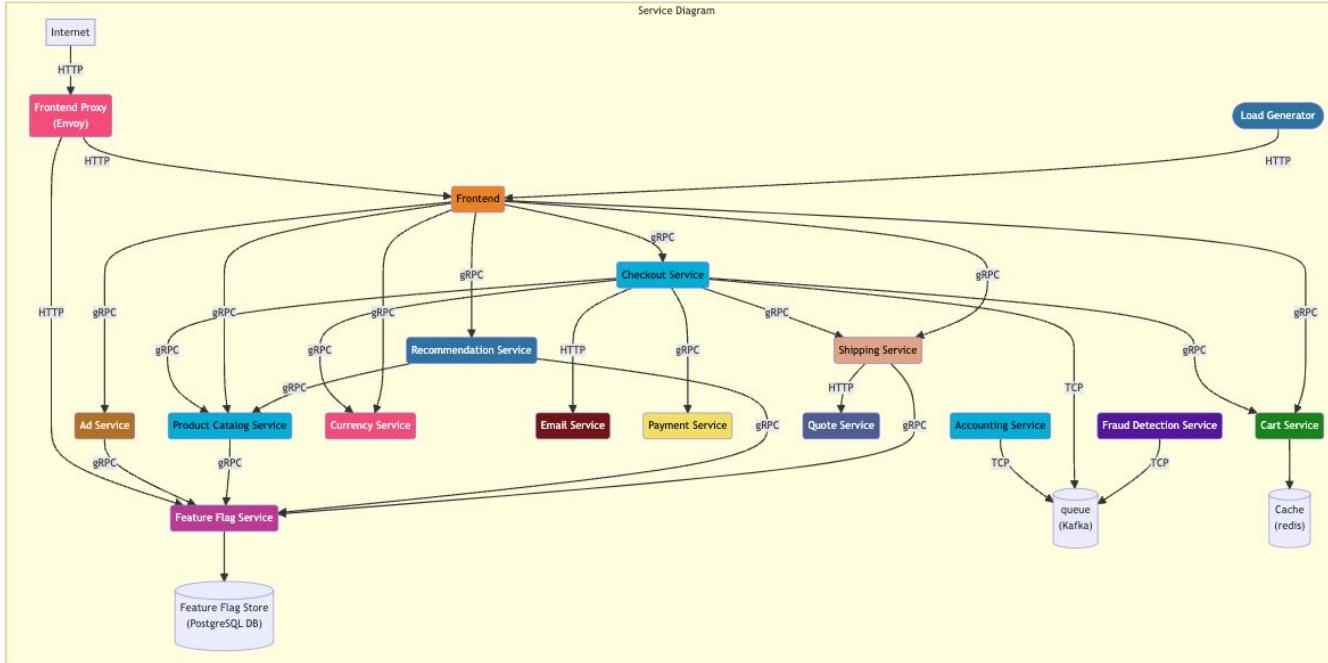
Tracing OpenTelemetry Demo

github.com/open-telemetry/opentelemetry-demo

Application Architecture

[Read more](#)

Source: <https://opentelemetry.io/>

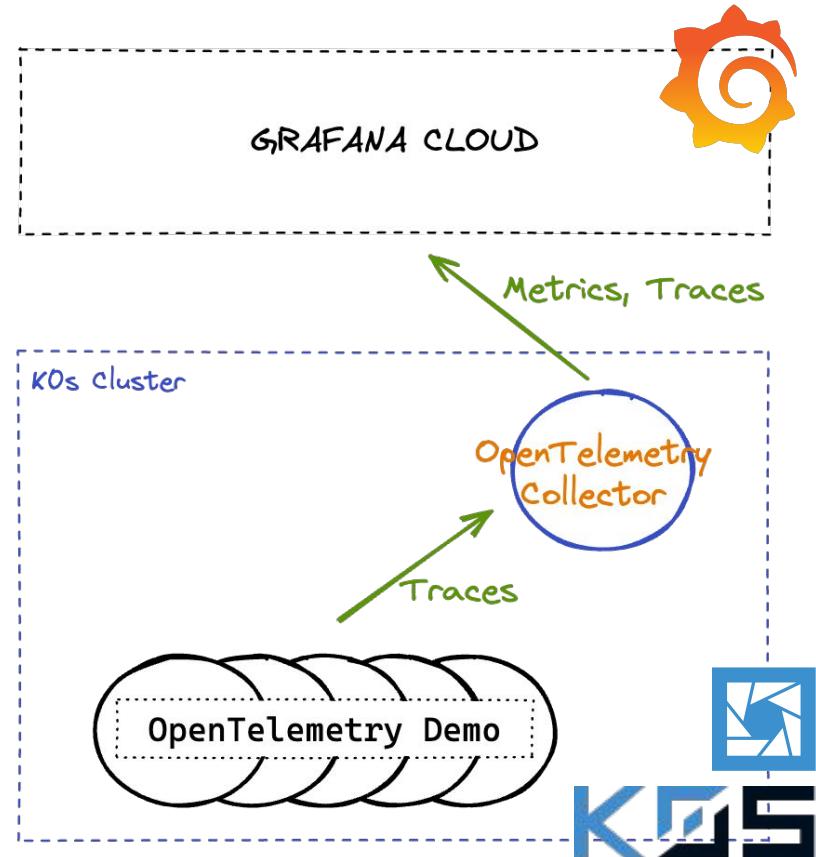


Service Legend



Setup

- Kubernetes Cluster
 - K0s Cluster via [Lens IDE](#) 😎
- OpenTelemetry Demo
 - Deployed via Helm
- OpenTelemetry Collector
 - Managed via OTel Operator
- Observability platform
 - [Grafana Cloud](#)



Tracing Kubernetes Components

Food for Thought 

Tracing Kubernetes Components [Read more](#)

API Server

- Beta-Feature with 1.27
- Export via gRPC
- Use Cases
 - Debugging webhook issues
 - ...



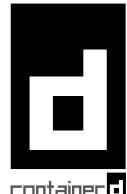
kubernetes

Kubelet

- Beta-Feature with 1.27
- Export via gRPC
- Use Cases
 - Garbage collection
 - Pod sync routine
 - ...

(Containerd)

- Only traces gRPC calls
- Export via HTTP/gRPC
- Via plugin configuration
- Read more [here](#)

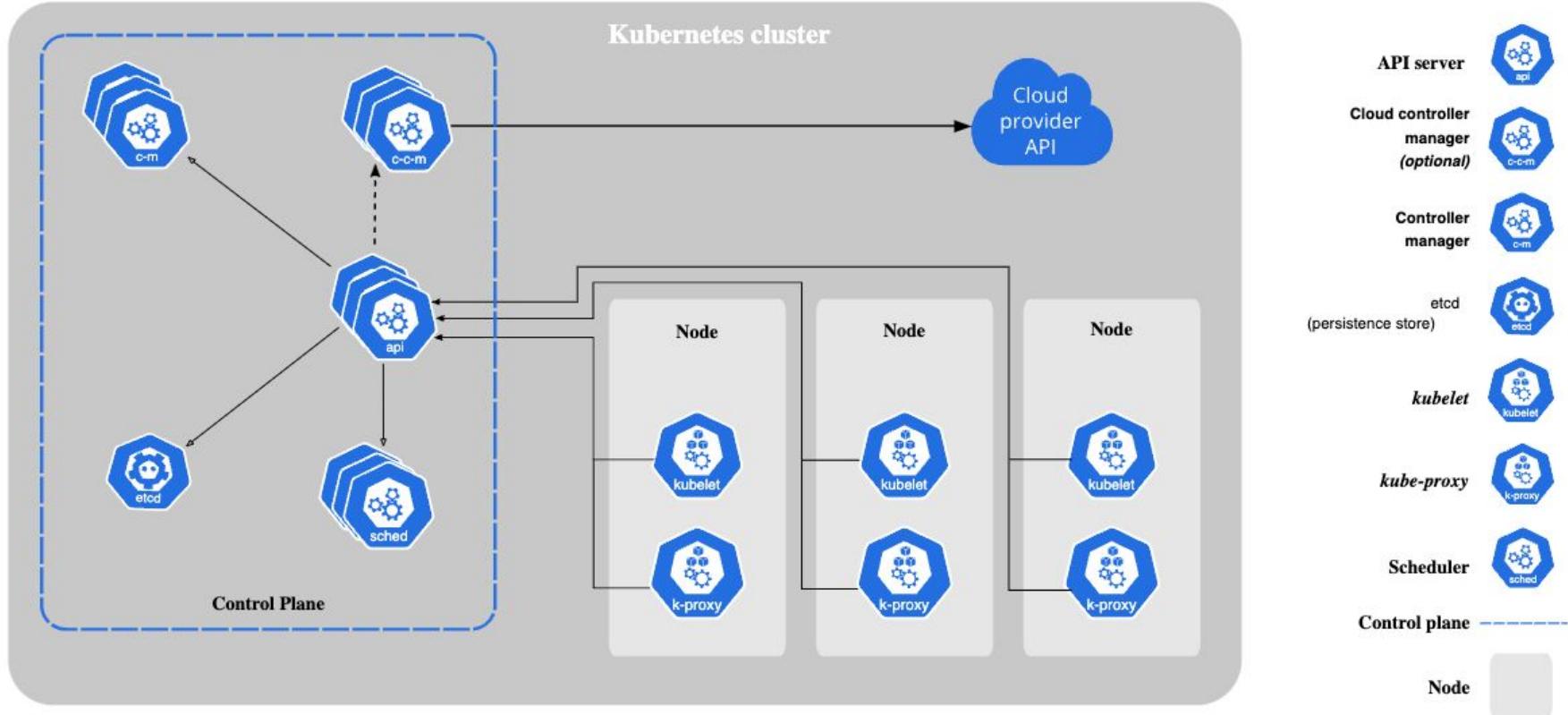


Q&A

Backup Slides

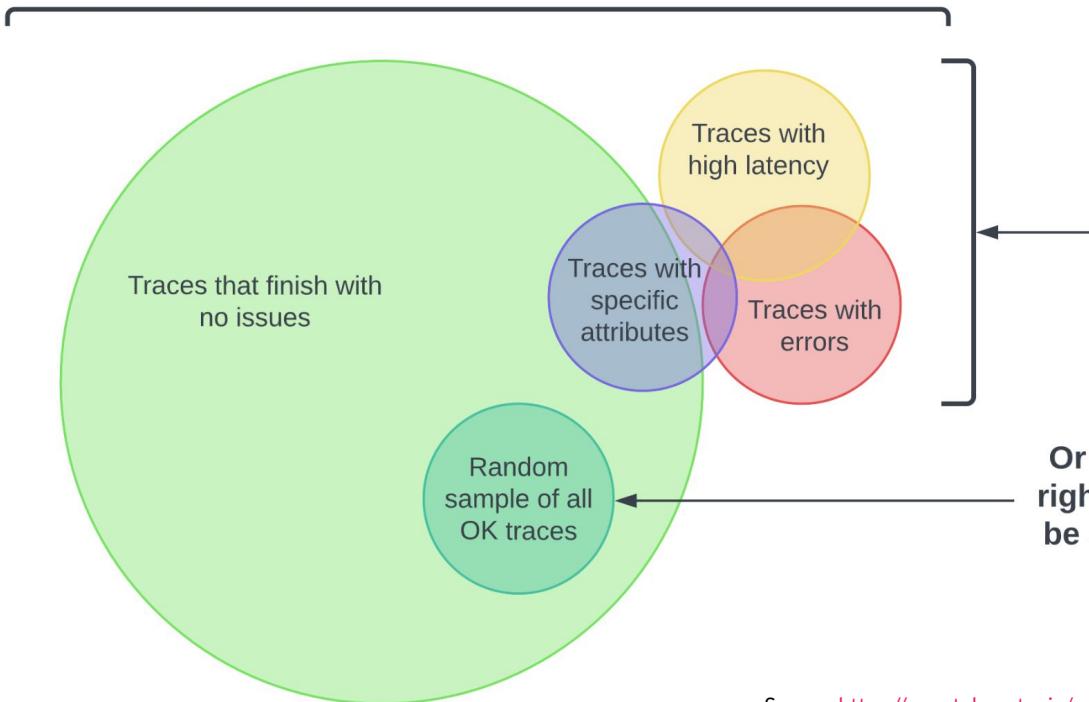
Kubernetes Components Overview

Source: <https://kubernetes.io/>



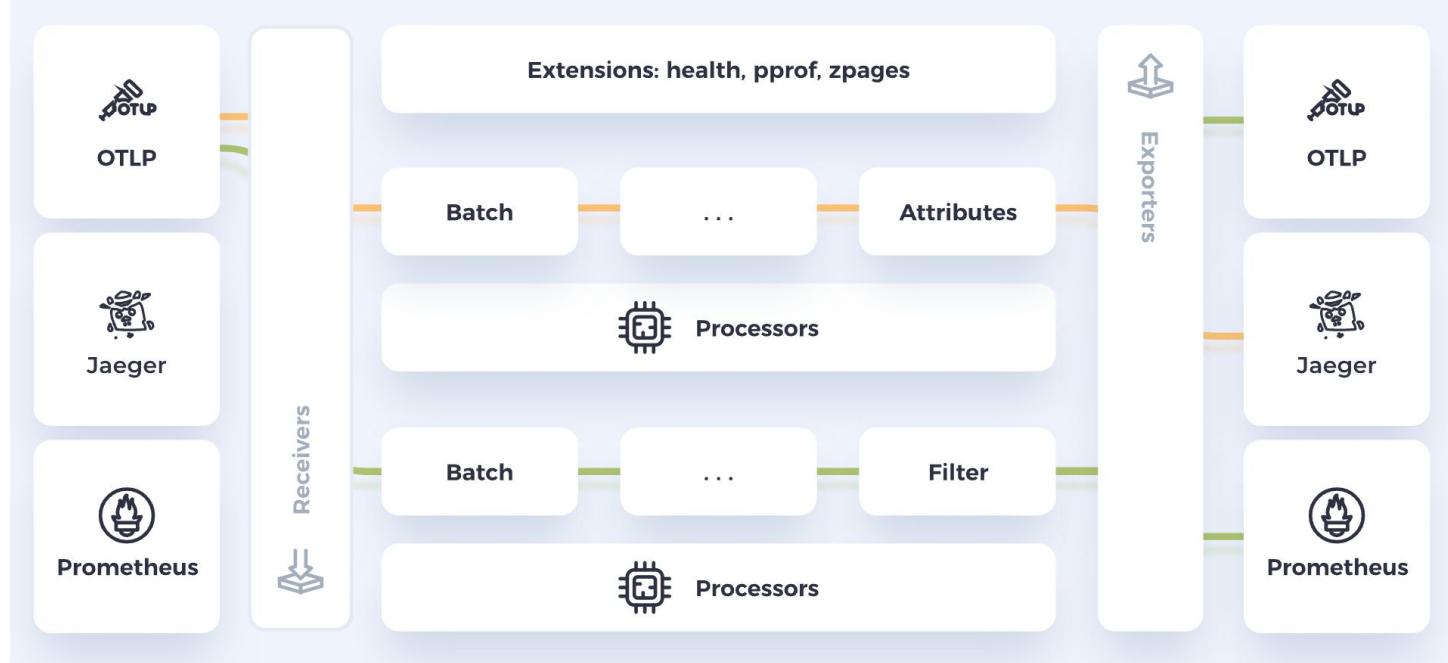
Trace Sampling

Do you really need all of this data?



Source: <https://opentelemetry.io/>

OpenTelemetry Collector



Source: <https://opentelemetry.io/>

OpenTelemetry Operator for Kubernetes



- Kubernetes Operator
- Capabilities
 - Manages OpenTelemetry Collector deployments
 - Auto-instrumentation using OTEL libraries
- Supports Prometheus Operator CRDs like ServiceMonitor 💪
- Read more on [GitHub](#)

```
apiVersion: opentelemetry.io/v1alpha1
kind: OpenTelemetryCollector
metadata:
  name: collector-with-ta-prometheus-cr
spec:
  mode: statefulset
  targetAllocator:
    enabled: true
  serviceAccount: everything-prometheus-operator
  prometheusCR:
    enabled: true
  config: |
    receivers:
      prometheus:

    exporters:
      logging:

    service:
      pipelines:
        metrics:
          receivers: [prometheus]
          processors: []
          exporters: [logging]
```