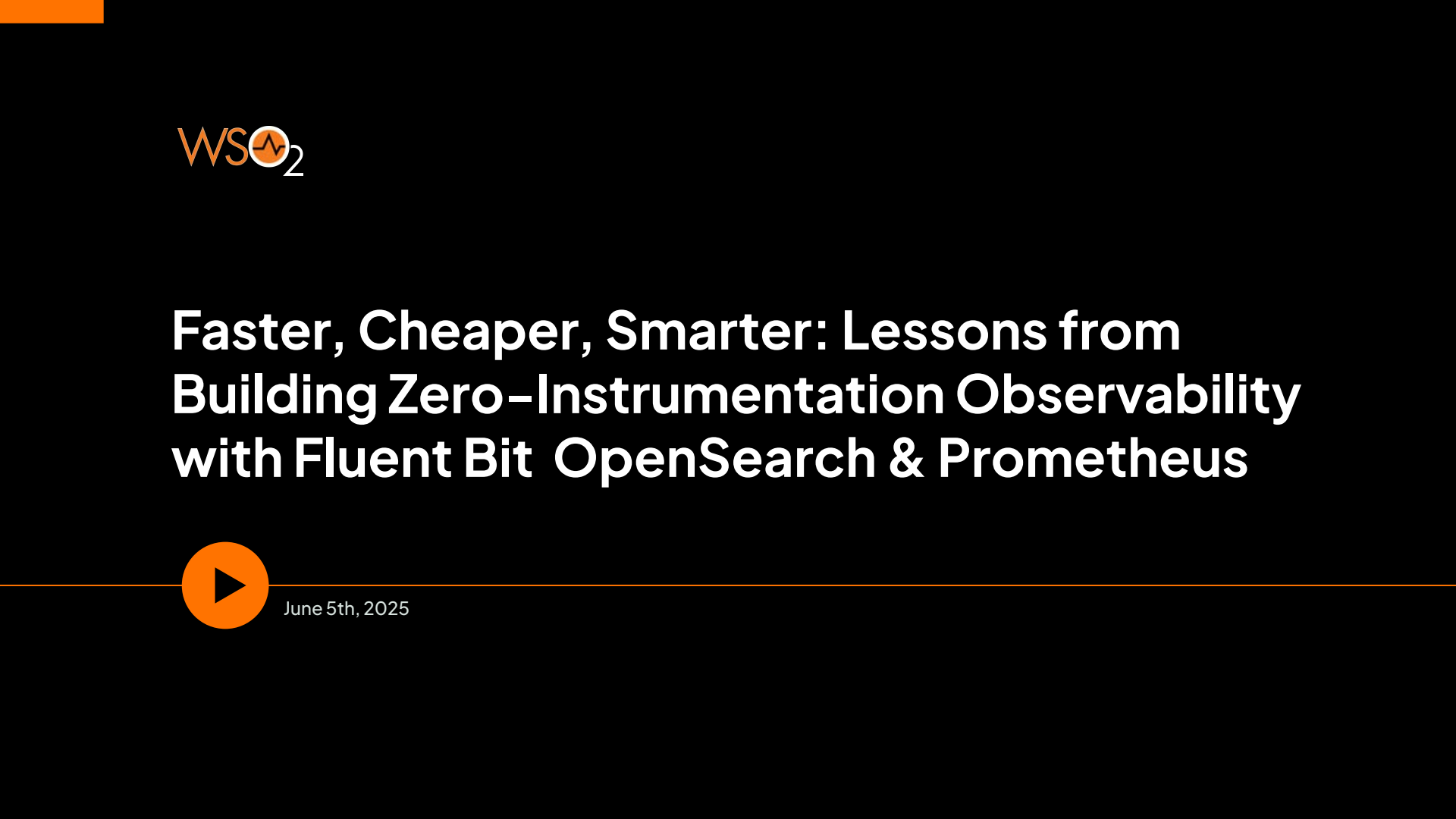


Faster, Cheaper, Smarter: Lessons from Building Zero-Instrumentation Observability with Fluent Bit OpenSearch & Prometheus

June 5th, 2025

Hello!

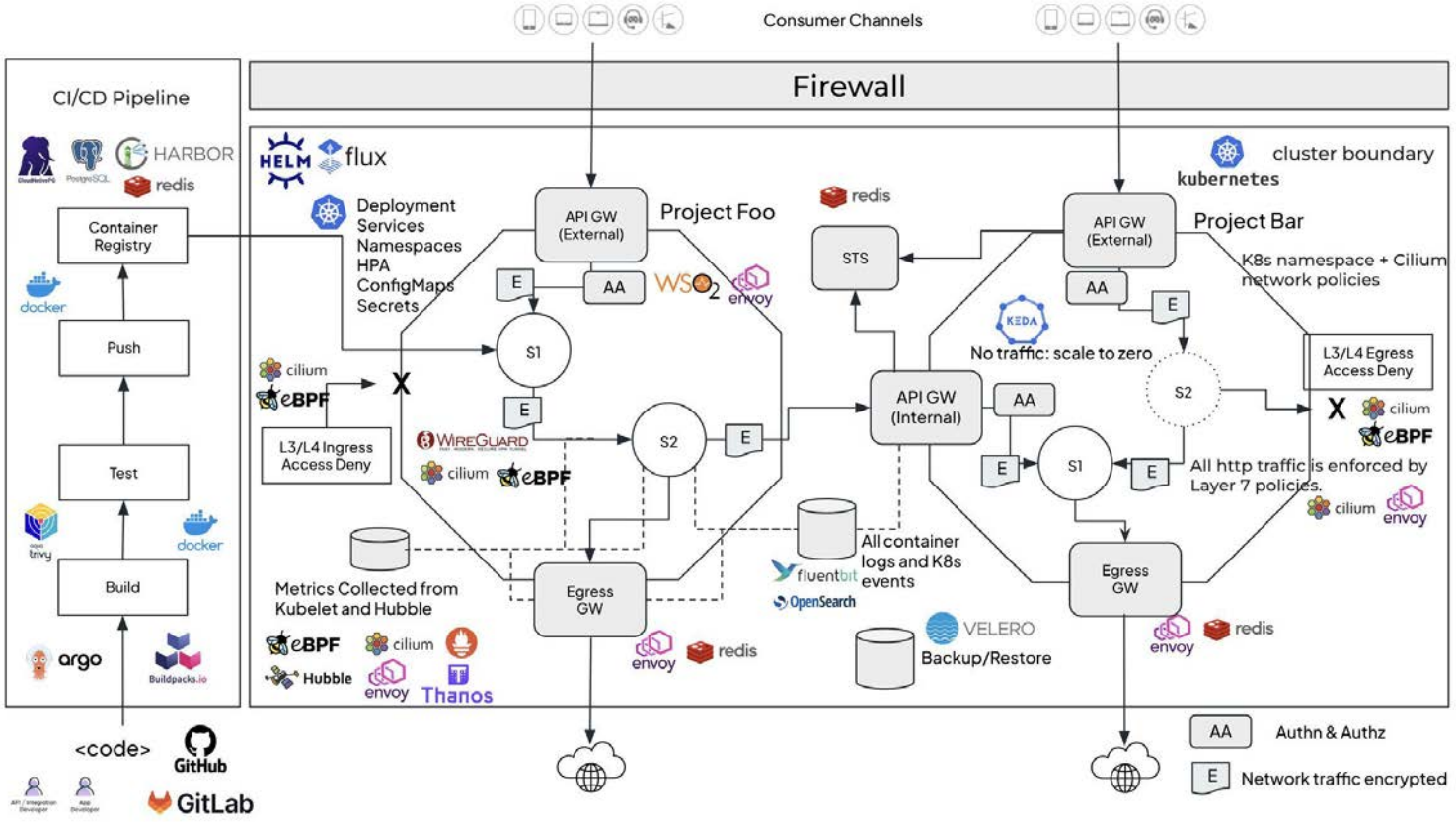
Nilushan Costa

Associate Technical Lead

Isala Piyarisi

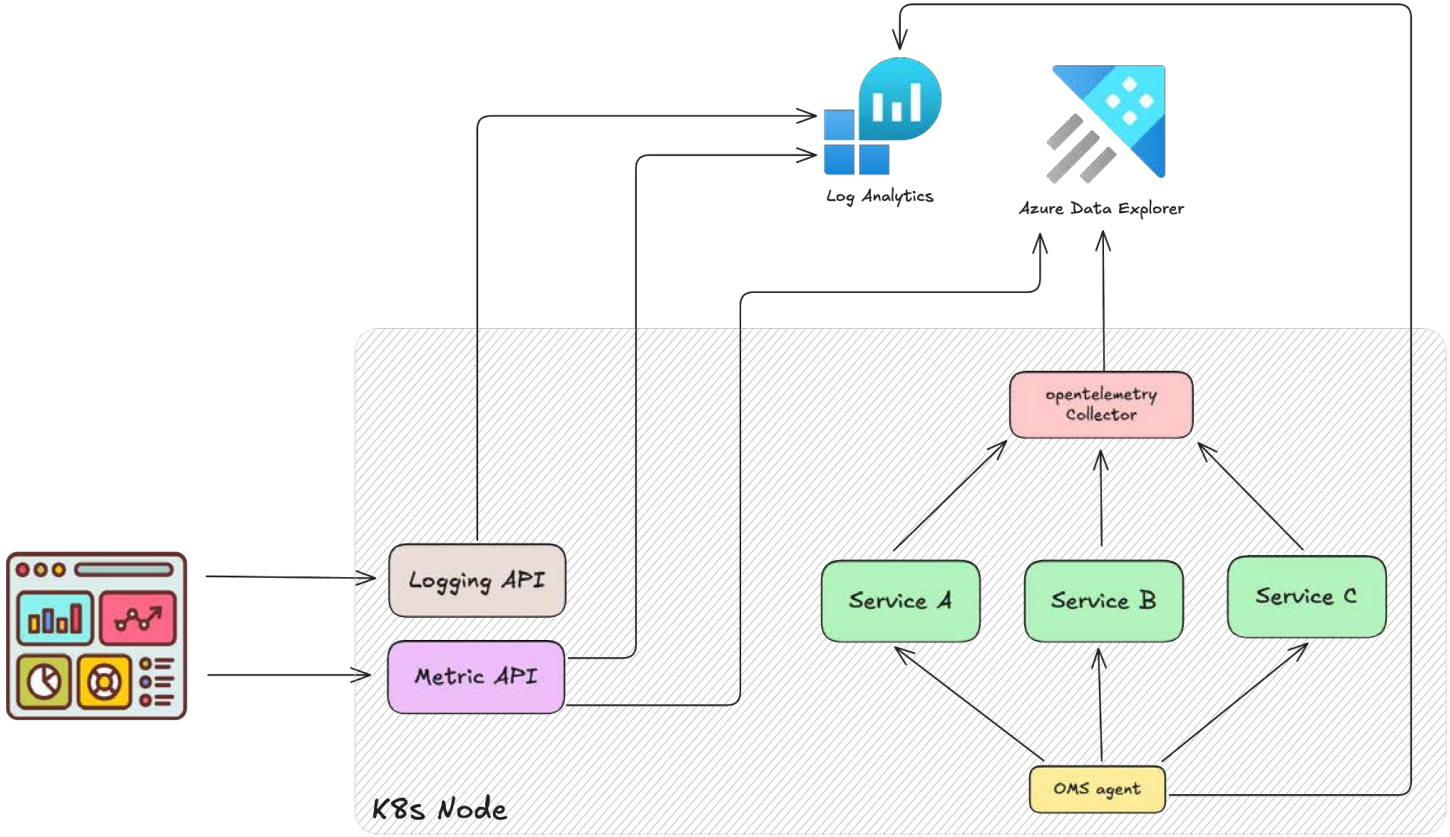
Senior Software Engineer

Who We Are & What is Choreo?



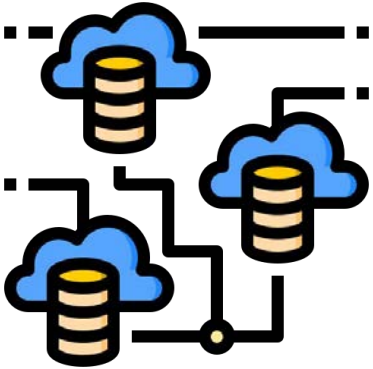
History

The "Before" State: Azure-centric Observability



The Mounting Challenges

Skyrocketing Costs



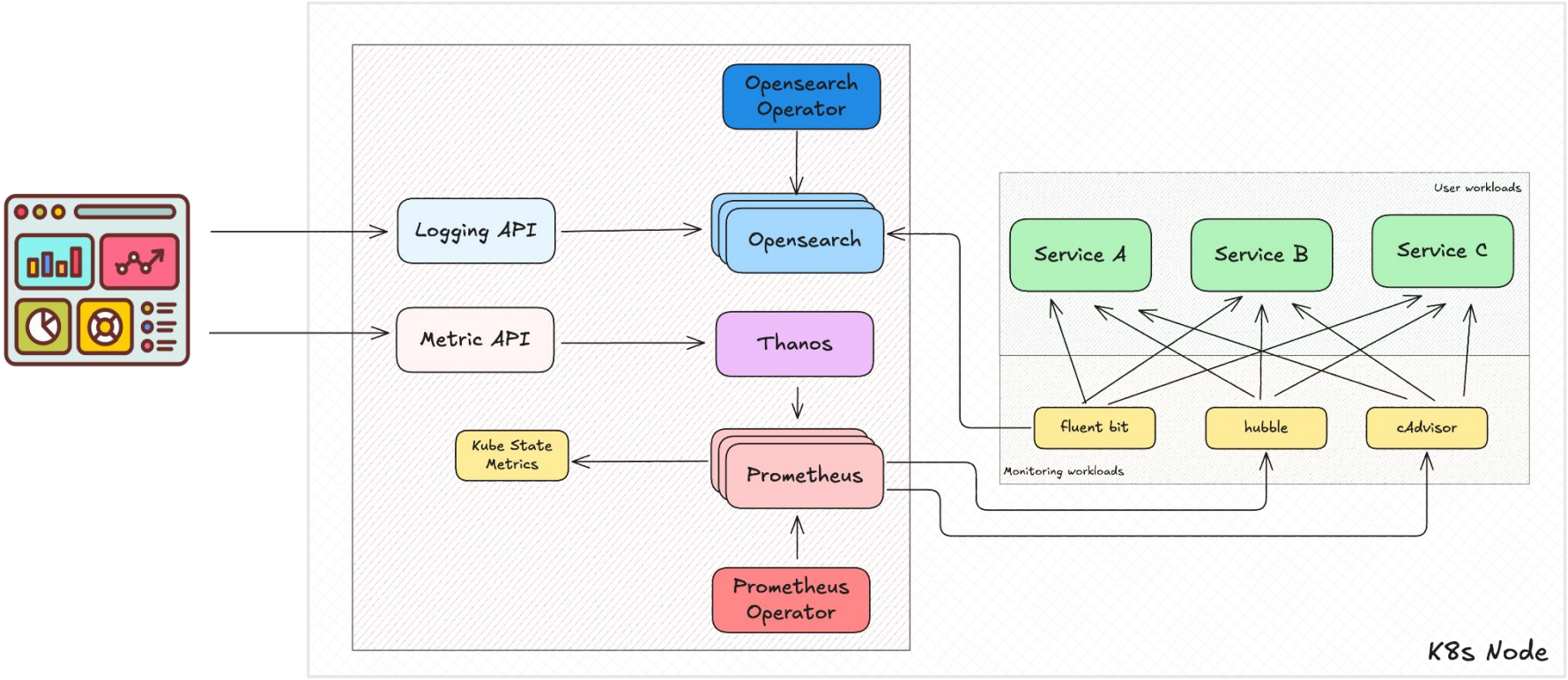
Multi cloud

Limited Control & Flexibility

Our Goals: A User-Centric, Future-Proof Vision

- For Choreo Users:
  - Speed
  - Smarter Tools
  - Zero-Instrumentation
- For the Choreo Platform:
  - Cost Reduction
  - Cloud Agnostic
  - Data Sovereignty
  - Control & Innovation

The New Stack: OSS Power!



Logs

Solving the Log Latency Problem

- *“The average latency to ingest log data is between 20 seconds and 3 minutes. The specific latency for any particular data will vary depending on several factors”*
- Goal: <=5 seconds
- “tail -f” experience
- Fluent Bit + OpenSearch latency

Solving the Log Latency Problem

- OpenSearch as a cache
- Combine data from 2 APIs
  - Live logs API - OpenSearch
  - Historical logs API - Log Analytics

Logs Stack

- Fluent Bit
- OpenSearch
- OpenSearch Dashboard
- Logging API

Deployment

- Helm chart based on upstream chart
- Distributed deployment of OpenSearch
- OpenSearch Operator
- Multiple layers of backups

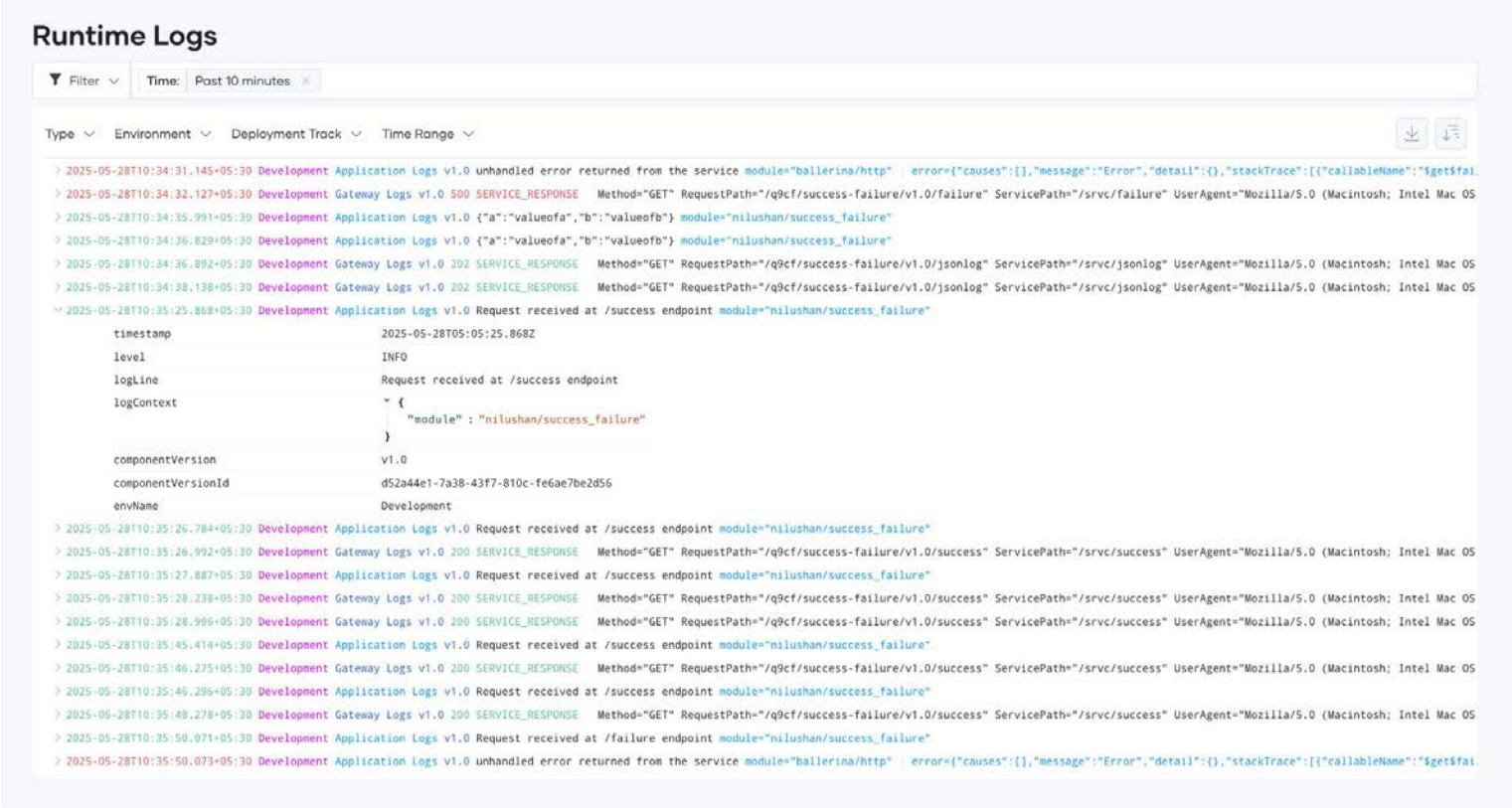
Cost Savings

- ~USD 1800 per month saving for one dataplane in Azure
- ~USD 2500 per day for one customer in AWS

Lessons

- Store raw logs if schema is not the same
- Log throttling
- Health monitoring
- Storage medium
- Look at the stack as a whole when debugging
- Fluent Bit Inotify_Watcher

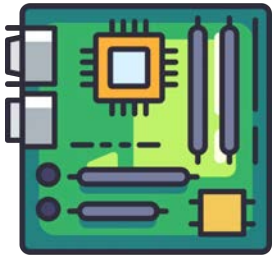
Logs


Runtime Logs
Filter
Time: Past 10 minutes
Type
Environment
Deployment Track
Time Range
2025-05-28T10:34:31.145+05:30 Development Application Logs v1.0 unhandled error returned from the service module="ballerina/http" error={"causes":[],"message":"Error","detail":{},"stackTrace":[{"callableName":"getfai
2025-05-28T10:34:32.127+05:30 Development Gateway Logs v1.0 500 SERVICE_RESPONSE Method="GET" RequestPath="/q9cf/success-failure/v1.0/failure" ServicePath="/srvc/failure" UserAgent="Mozilla/5.0 (Macintosh; Intel Mac OS
2025-05-28T10:34:35.991+05:30 Development Application Logs v1.0 {"a":"valueofa","b":"valueofb"} module="nilushan/success_failure"
2025-05-28T10:34:36.829+05:30 Development Application Logs v1.0 {"a":"valueofa","b":"valueofb"} module="nilushan/success_failure"
2025-05-28T10:34:36.892+05:30 Development Gateway Logs v1.0 202 SERVICE_RESPONSE Method="GET" RequestPath="/q9cf/success-failure/v1.0/jsonlog" ServicePath="/srvc/jsonlog" UserAgent="Mozilla/5.0 (Macintosh; Intel Mac OS
2025-05-28T10:34:38.138+05:30 Development Gateway Logs v1.0 202 SERVICE_RESPONSE Method="GET" RequestPath="/q9cf/success-failure/v1.0/jsonlog" ServicePath="/srvc/jsonlog" UserAgent="Mozilla/5.0 (Macintosh; Intel Mac OS
2025-05-28T10:35:25.868+05:30 Development Application Logs v1.0 Request received at /success endpoint module="nilushan/success_failure"
timestamp 2025-05-28T05:05:25.868Z
level INFO
logLine Request received at /success endpoint
logContext { "module" : "nilushan/success_failure" }
componentVersion v1.0
componentVersionId d52a44e1-7a38-43f7-810c-fe6ae7be2d56
envName Development
2025-05-28T10:35:26.784+05:30 Development Application Logs v1.0 Request received at /success endpoint module="nilushan/success_failure"
2025-05-28T10:35:26.992+05:30 Development Gateway Logs v1.0 200 SERVICE_RESPONSE Method="GET" RequestPath="/q9cf/success-failure/v1.0/success" ServicePath="/srvc/success" UserAgent="Mozilla/5.0 (Macintosh; Intel Mac OS
2025-05-28T10:35:27.887+05:30 Development Application Logs v1.0 Request received at /success endpoint module="nilushan/success_failure"
2025-05-28T10:35:28.238+05:30 Development Gateway Logs v1.0 200 SERVICE_RESPONSE Method="GET" RequestPath="/q9cf/success-failure/v1.0/success" ServicePath="/srvc/success" UserAgent="Mozilla/5.0 (Macintosh; Intel Mac OS
2025-05-28T10:35:28.996+05:30 Development Gateway Logs v1.0 200 SERVICE_RESPONSE Method="GET" RequestPath="/q9cf/success-failure/v1.0/success" ServicePath="/srvc/success" UserAgent="Mozilla/5.0 (Macintosh; Intel Mac OS
2025-05-28T10:35:45.414+05:30 Development Application Logs v1.0 Request received at /success endpoint module="nilushan/success_failure"
2025-05-28T10:35:46.275+05:30 Development Gateway Logs v1.0 200 SERVICE_RESPONSE Method="GET" RequestPath="/q9cf/success-failure/v1.0/success" ServicePath="/srvc/success" UserAgent="Mozilla/5.0 (Macintosh; Intel Mac OS
2025-05-28T10:35:46.296+05:30 Development Application Logs v1.0 Request received at /success endpoint module="nilushan/success_failure"
2025-05-28T10:35:48.278+05:30 Development Gateway Logs v1.0 200 SERVICE_RESPONSE Method="GET" RequestPath="/q9cf/success-failure/v1.0/success" ServicePath="/srvc/success" UserAgent="Mozilla/5.0 (Macintosh; Intel Mac OS
2025-05-28T10:35:50.071+05:30 Development Application Logs v1.0 Request received at /failure endpoint module="nilushan/success_failure"
2025-05-28T10:35:50.073+05:30 Development Application Logs v1.0 unhandled error returned from the service module="ballerina/http" error={"causes":[],"message":"Error","detail":{},"stackTrace":[{"callableName":"getfai

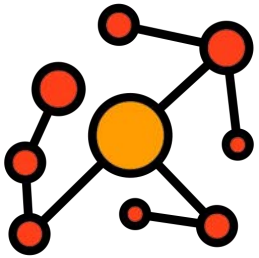
Metrics

High level goals

HTTP Metrics



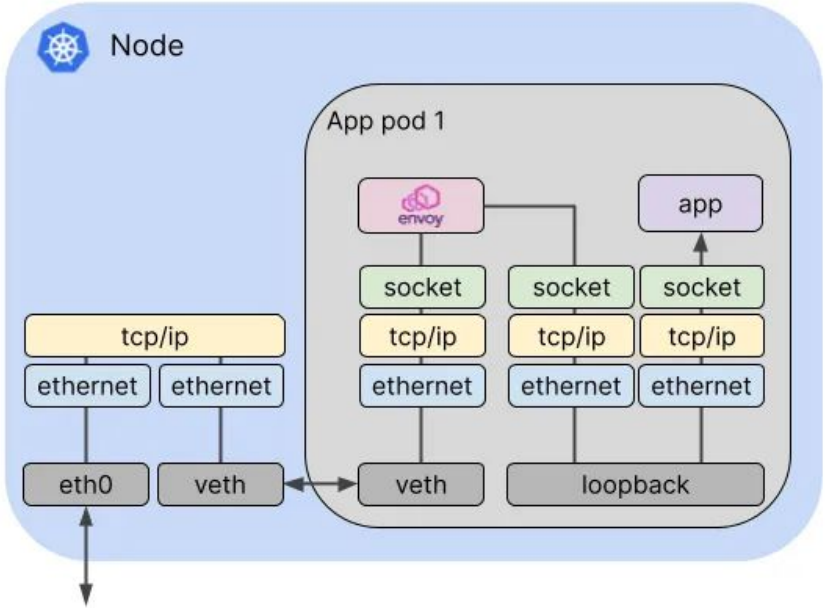
Usage Metrics



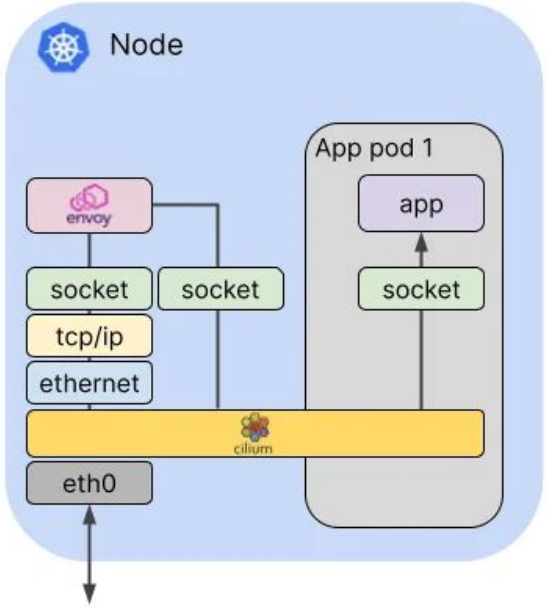
Service diagram

Deep Dive: HTTP Metrics via Hubble

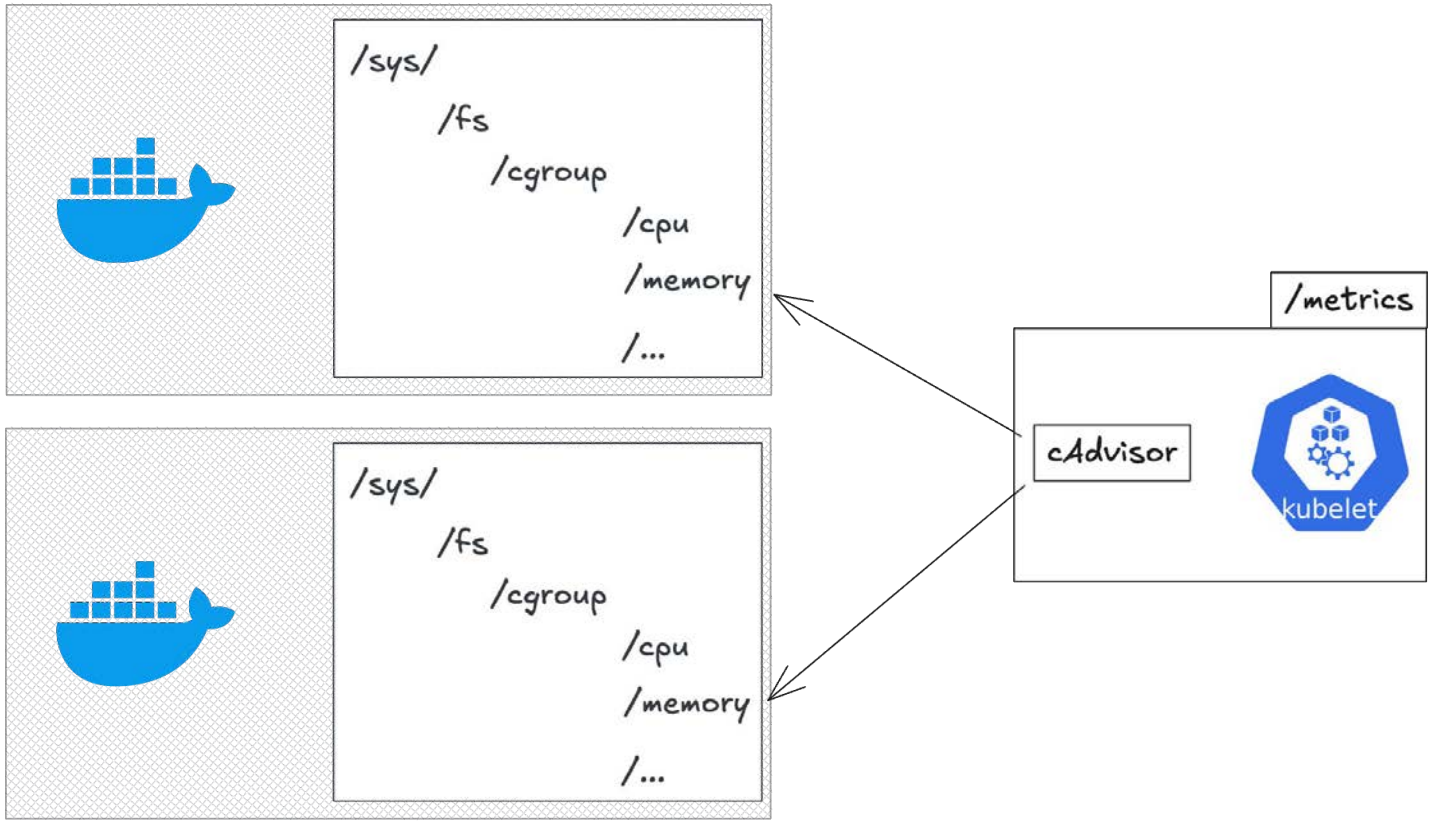
Service mesh with traditional networking



Sidecarless model, eBPF acceleration



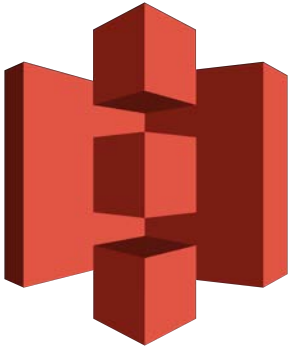
Deep Dive: Usage via cAdvisor



Deep Dive: Kubernetes Context

Deep Dive: Reliability

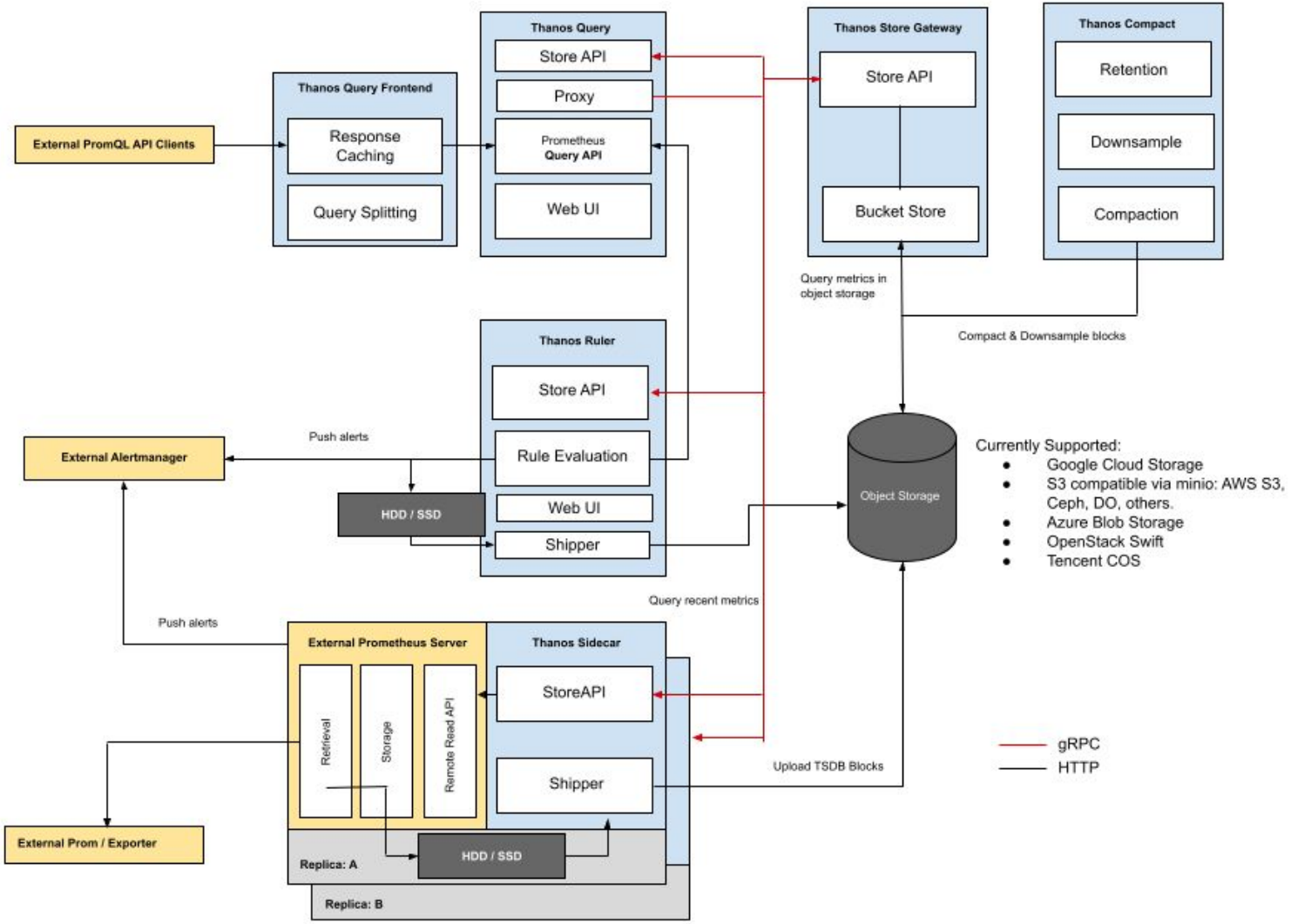
Thanos



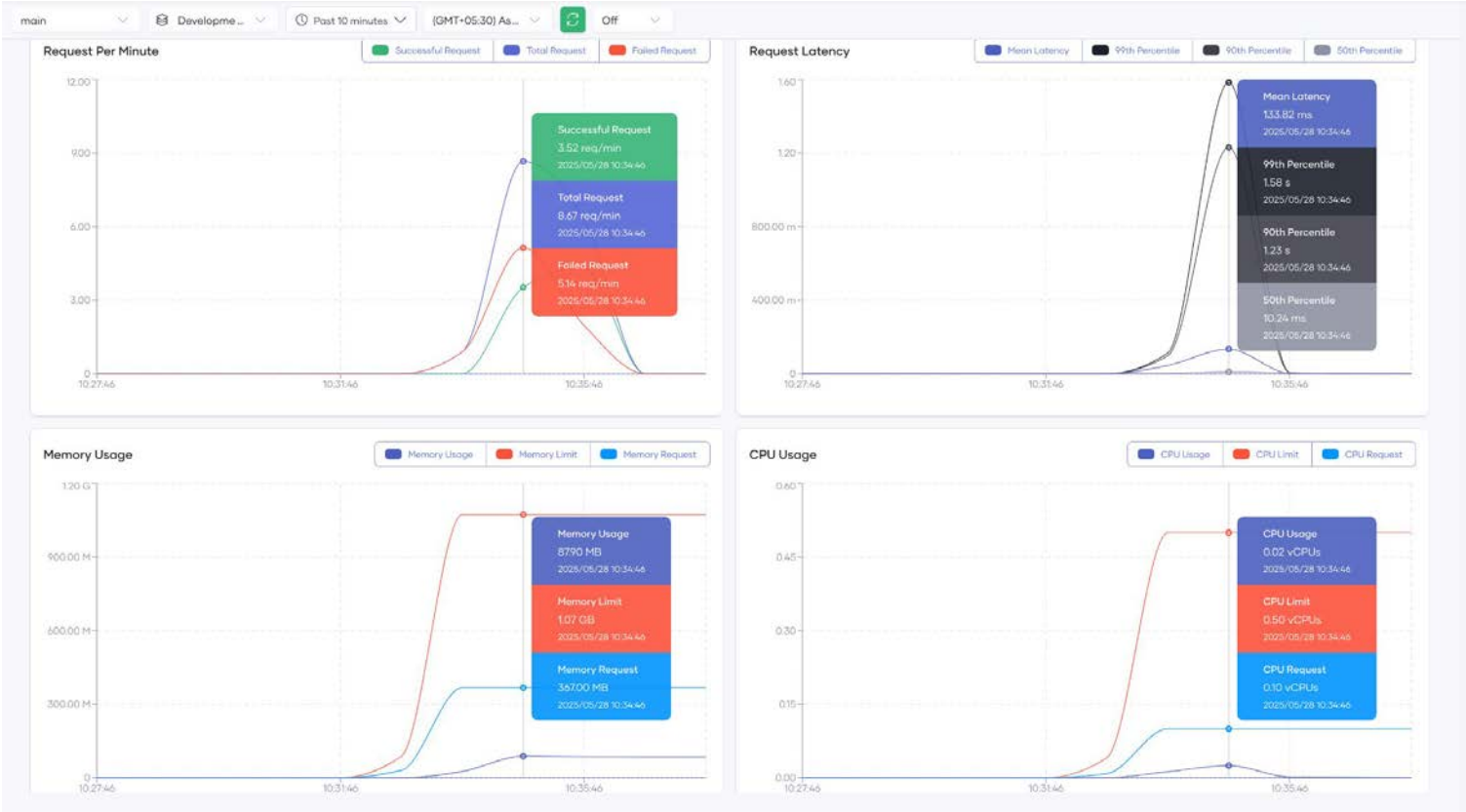
AWS S3

Azure Blob Storage

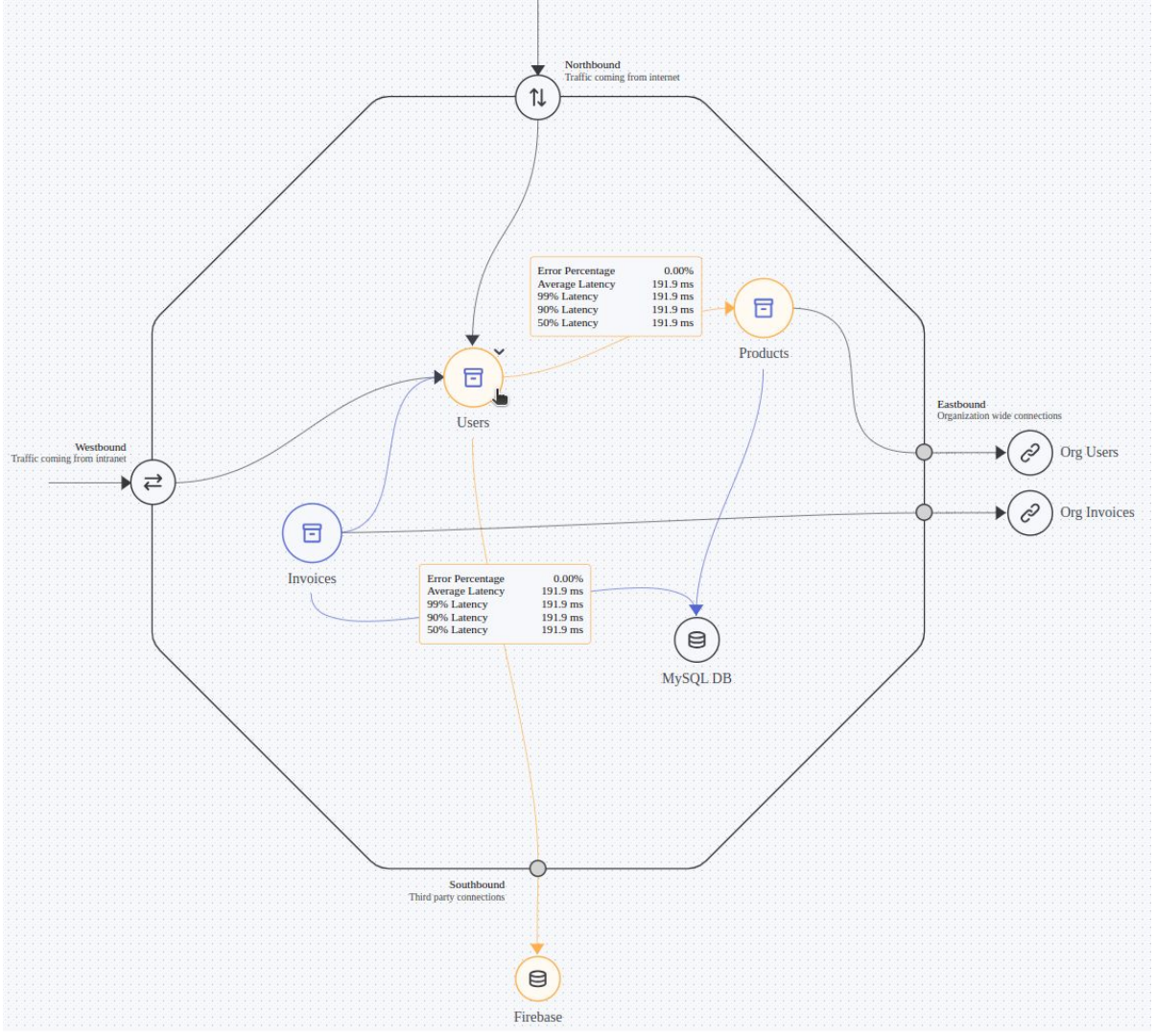
GCP Cloud Storage


Thanos Query
Store API
Proxy
Prometheus
Query API
Web UI
Thanos Query Frontend
Response
Caching
Query Splitting
External PromQL API Clients
Thanos Store Gateway
Store API
Bucket Store
Thanos Compact
Retention
Downsample
Compaction
Query metrics in
object storage
Compact & Downsample blocks
Thanos Ruler
Store API
Rule Evaluation
Web UI
Shipper
HDD / SSD
Push alerts
External Alertmanager
Object Storage
Currently Supported:
Google Cloud Storage
S3 compatible via minio: AWS S3, Ceph, DO, others.
Azure Blob Storage
OpenStack Swift
Tencent COS
Query recent metrics
Push alerts
External Prometheus Server
Retrieval
Storage
Remote Read API
Thanos Sidecar
StoreAPI
Shipper
Upload TSDB Blocks
gRPC
HTTP
External Prom / Exporter
Replica: A
HDD / SSD
Replica: B

Metrics


main
Developme...
Past 10 minutes
(GMT+05:30) As...
Off
Request Per Minute
Successful Request
Total Request
Failed Request
Successful Request
3.52 req/min
2025/05/28 10:34:46
Total Request
8.67 req/min
2025/05/28 10:34:46
Failed Request
5.14 req/min
2025/05/28 10:34:46
12.00
9.00
6.00
3.00
0
10:27:46
10:31:46
10:35:46
Request Latency
Mean Latency
99th Percentile
90th Percentile
50th Percentile
Mean Latency
133.82 ms
2025/05/28 10:34:46
99th Percentile
1.58 s
2025/05/28 10:34:46
90th Percentile
1.23 s
2025/05/28 10:34:46
50th Percentile
10.24 ms
2025/05/28 10:34:46
1.60
1.20
800.00 m
400.00 m
0
10:27:46
10:31:46
10:35:46
Memory Usage
Memory Usage
Memory Limit
Memory Request
Memory Usage
8790 MB
2025/05/28 10:34:46
Memory Limit
1.07 GB
2025/05/28 10:34:46
Memory Request
367.00 MB
2025/05/28 10:34:46
1.20 G
900.00 M
600.00 M
300.00 M
0
10:27:46
10:31:46
10:35:46
CPU Usage
CPU Usage
CPU Limit
CPU Request
CPU Usage
0.02 vCPUs
2025/05/28 10:34:46
CPU Limit
0.50 vCPUs
2025/05/28 10:34:46
CPU Request
0.10 vCPUs
2025/05/28 10:34:46
0.60
0.45
0.30
0.15
0.00
10:27:46
10:31:46
10:35:46

Metrics


Northbound
Traffic coming from internet
Error Percentage 0.00%
Average Latency 191.9 ms
99% Latency 191.9 ms
90% Latency 191.9 ms
50% Latency 191.9 ms
Products
Users
Eastbound
Organization wide connections
Westbound
Traffic coming from intranet
Org Users
Org Invoices
Invoices
Error Percentage 0.00%
Average Latency 191.9 ms
99% Latency 191.9 ms
90% Latency 191.9 ms
50% Latency 191.9 ms
MySQL DB
Southbound
Third party connections
Firebase

Learned the hard way

- If you want accuracy use logs
- If there is an operator use the operator
- /metric cleanups are very important
- NFS are a bad idea
- sum of rates != rate of sums

Cost wise

- 1200 USD for ADX
- 1000 USD for Log Analytics
- ~250 USD in Compute
- ~100 USD in Storage

Conclusion

Conclusion

- Ability to easily enable Observability for new providers
- Ease of adding new features on top of the existing stack
  - Alerting
- Ease of debugging - Same setup everywhere
- Cost reduction

Thanks!

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