if(kakao)2021

Distributed tracing 도입기

Microservice architecture 에서의 debugging

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그라운드X

그라운드엑스와 DevOps 소개

Distributed tracing

Implementation

Use cases

Review

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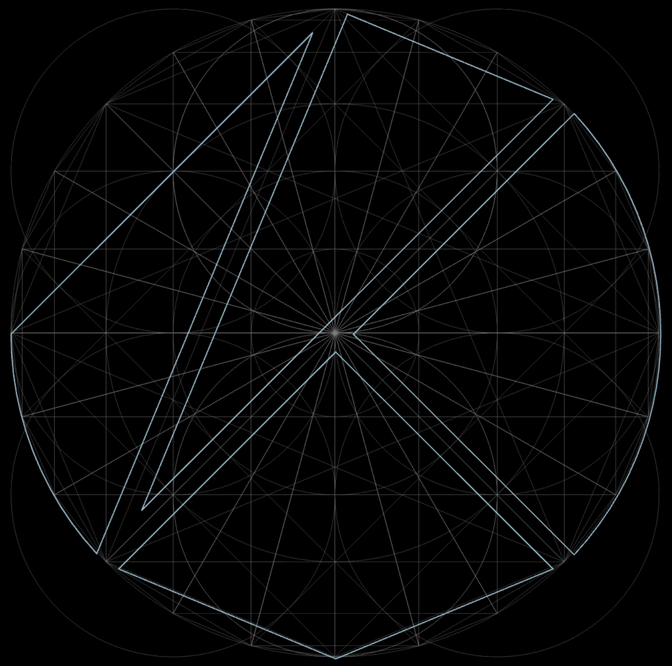
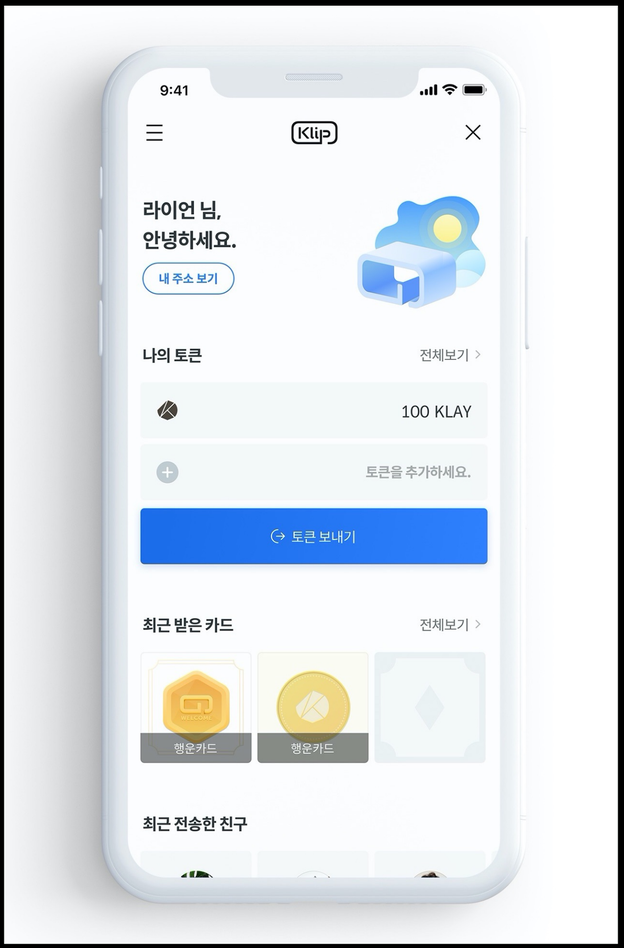
Blockchain platform

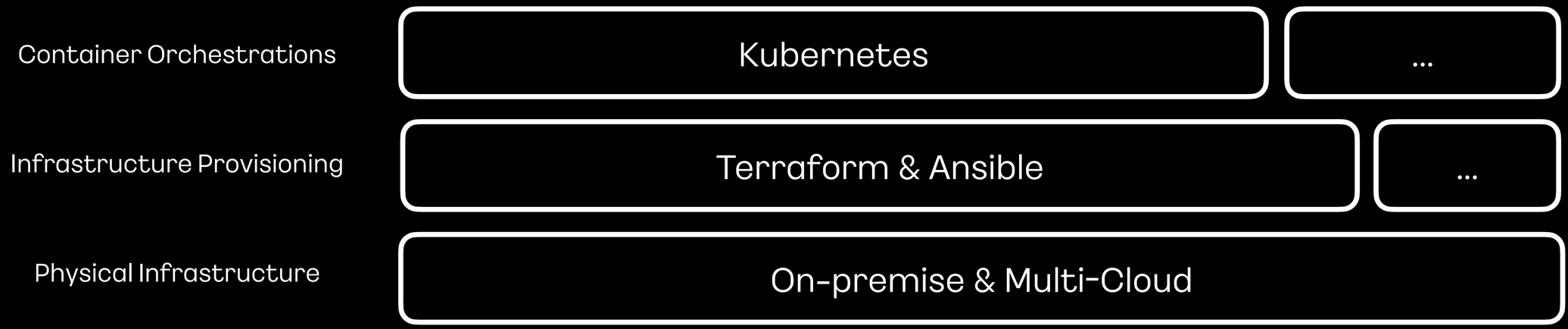


API Service

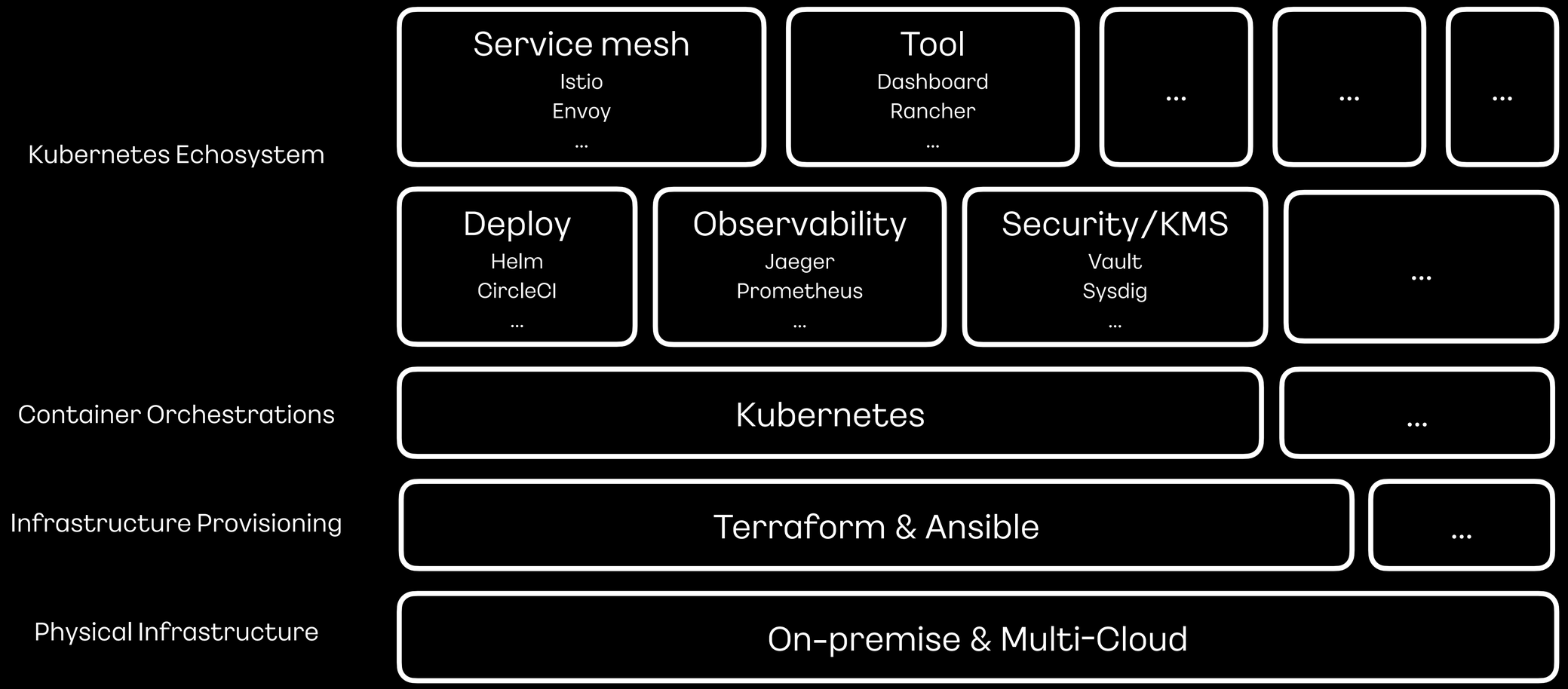
Wallet, NFT



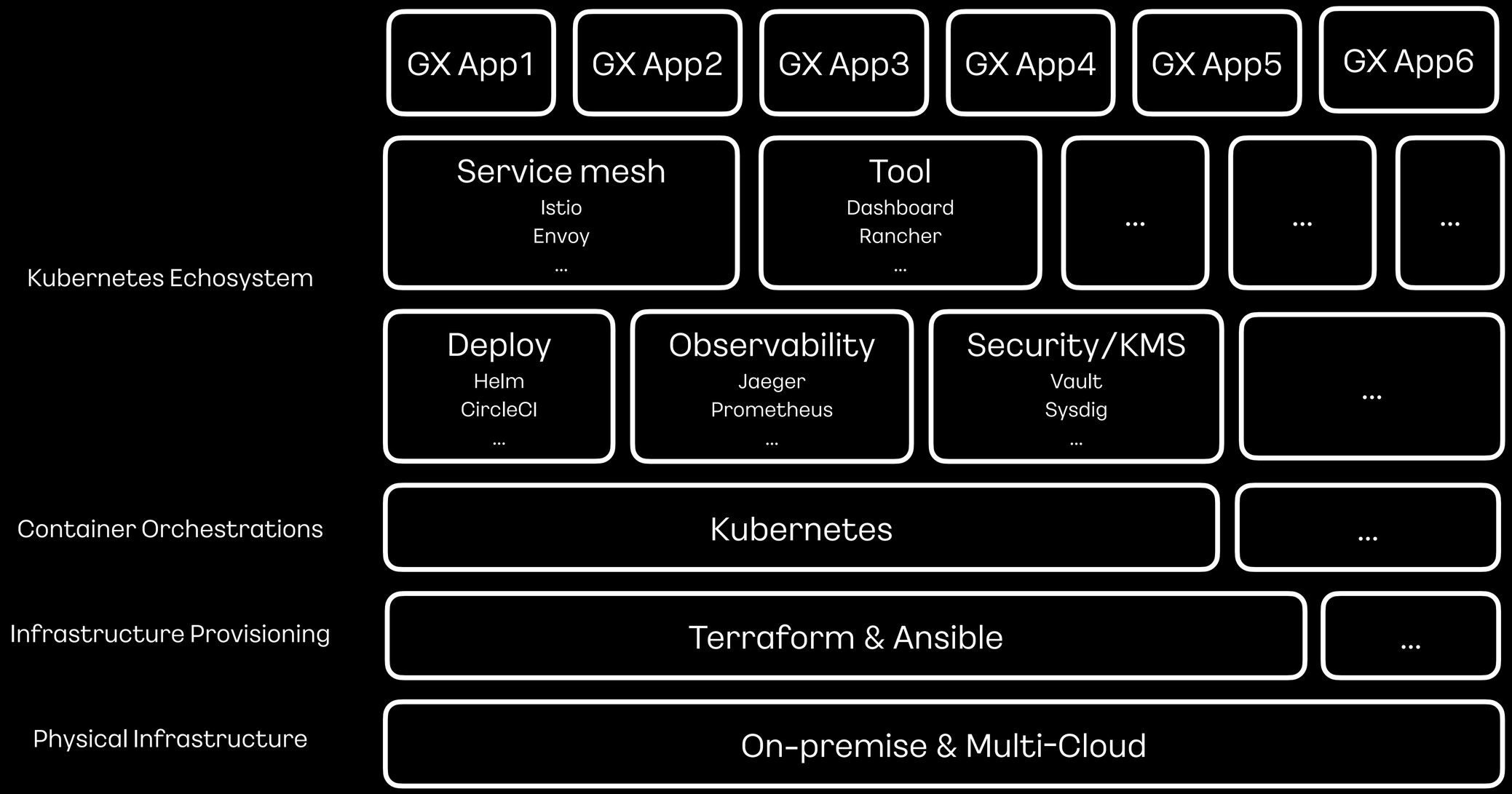
Infrastructure stack



Infrastructure stack



Infrastructure stack



그라운드엑스와 DevOps 소개

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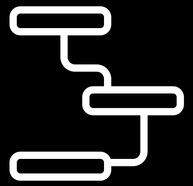
Observability

Metrics

- CPU, Memory Usage
- Alerting on SLOs

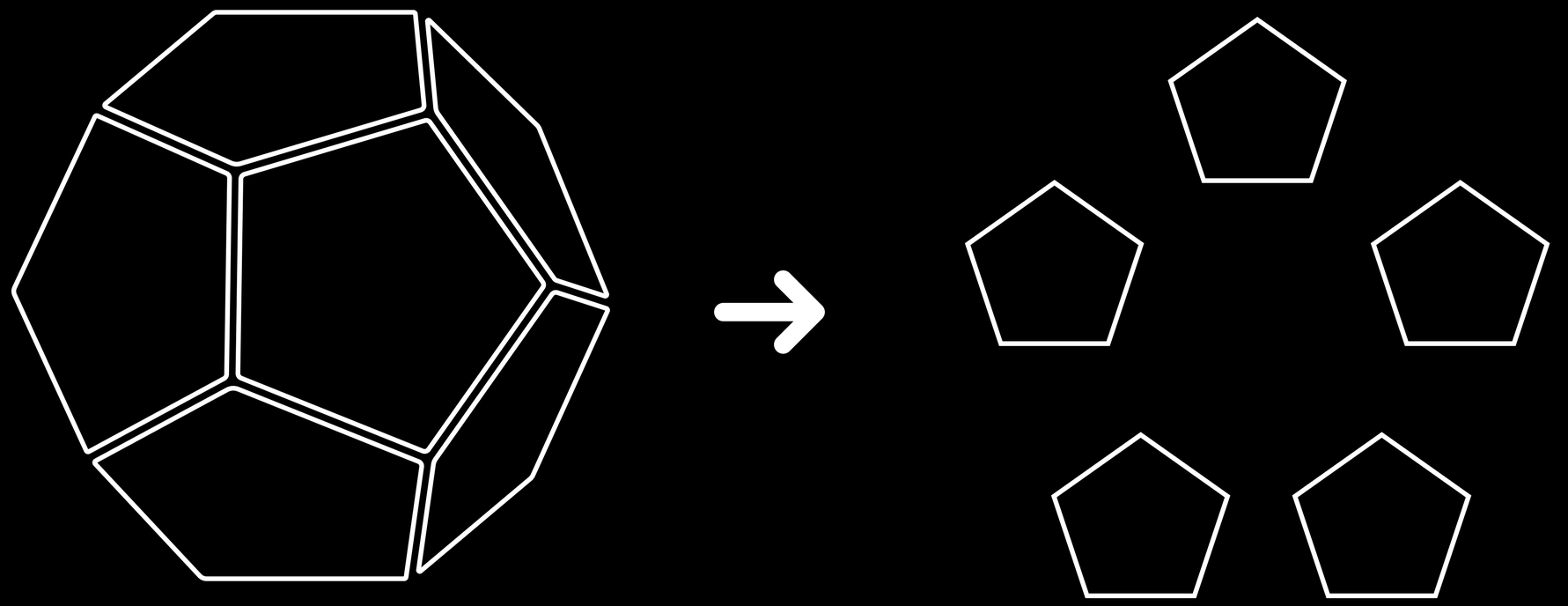
Logs

- Stacktrace, function error
- Debugging

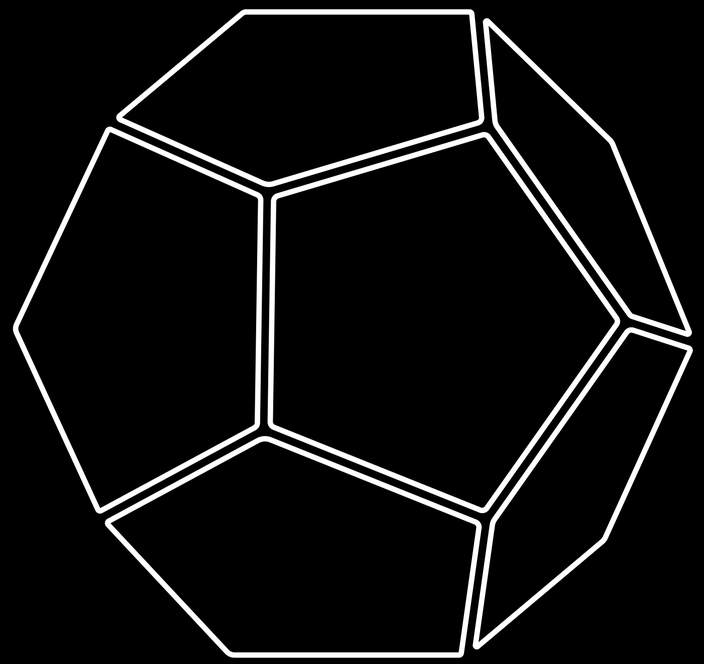


Trace

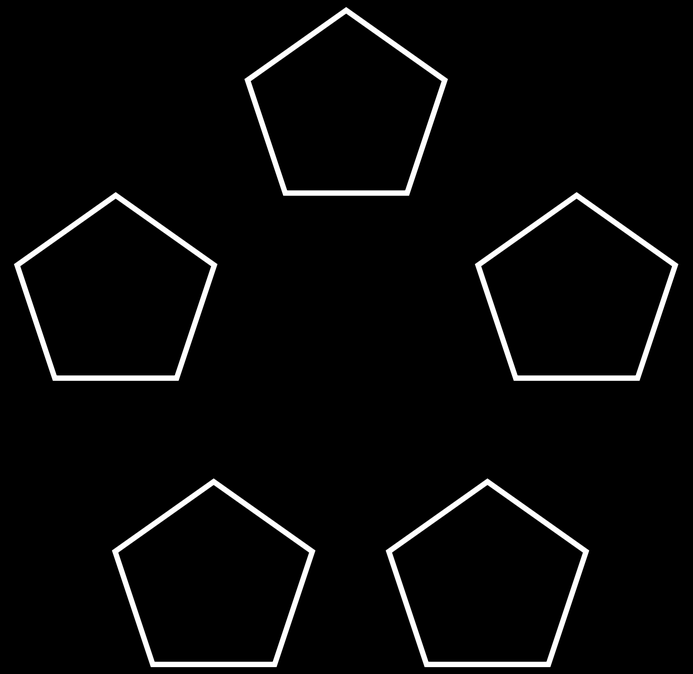
Monolith to Microservice



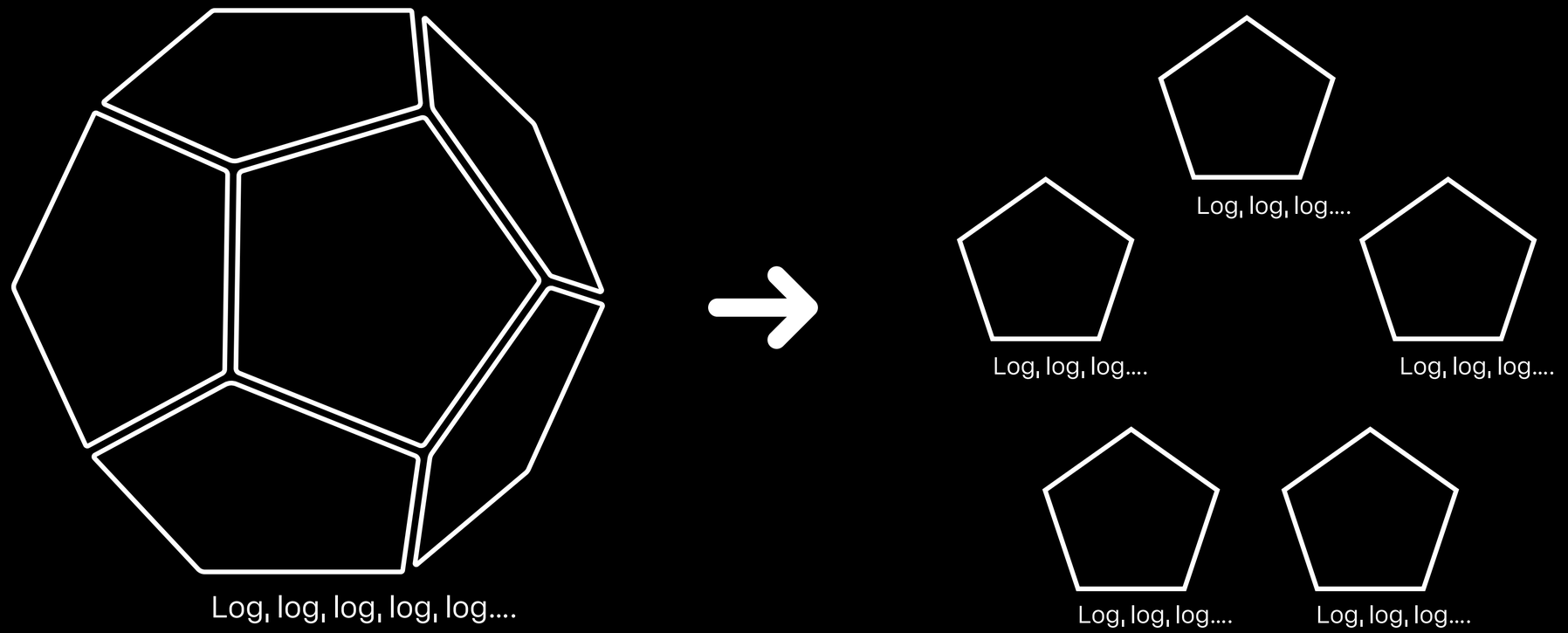
Monolith to Microservice



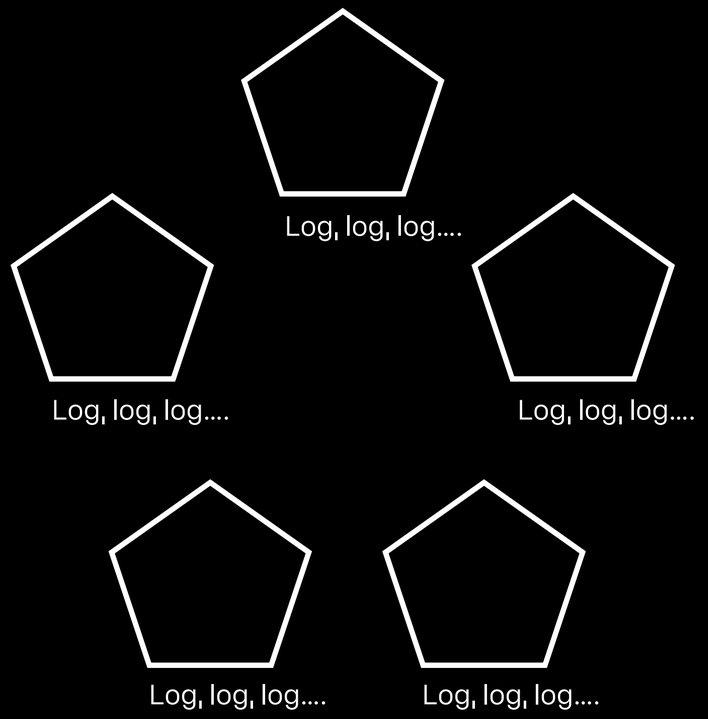
Log, log, log, log, log....



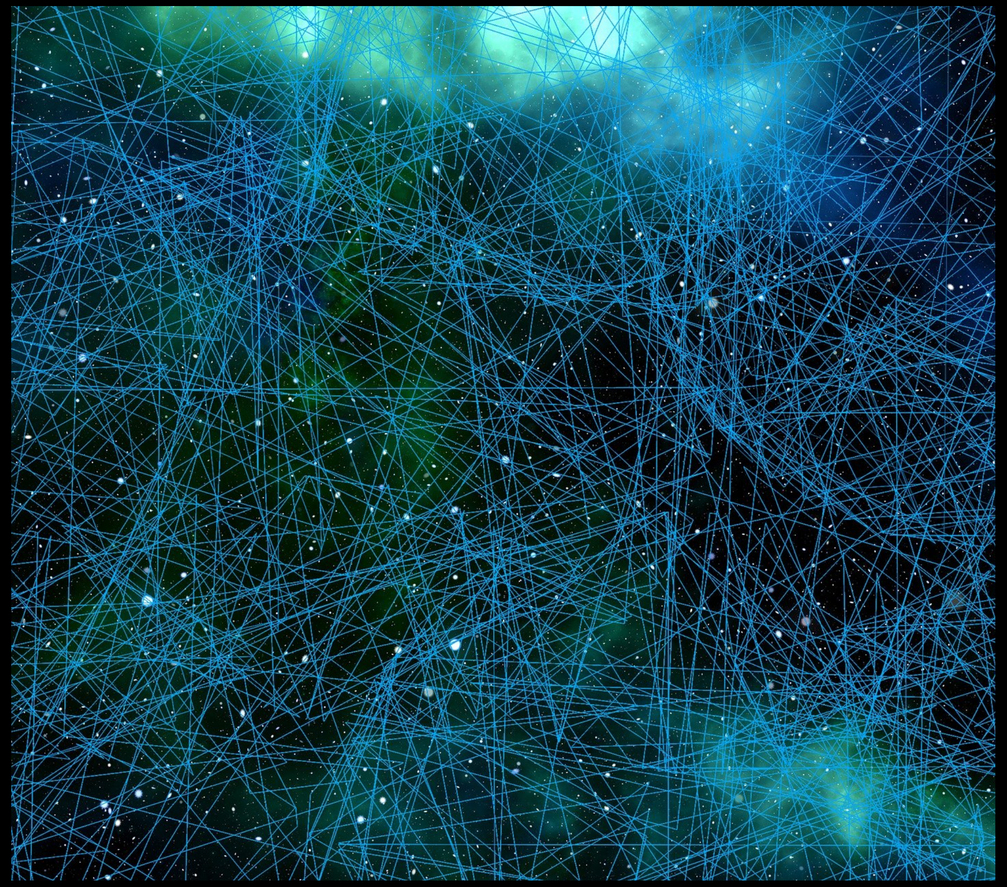
Monolith to Microservice



Release!



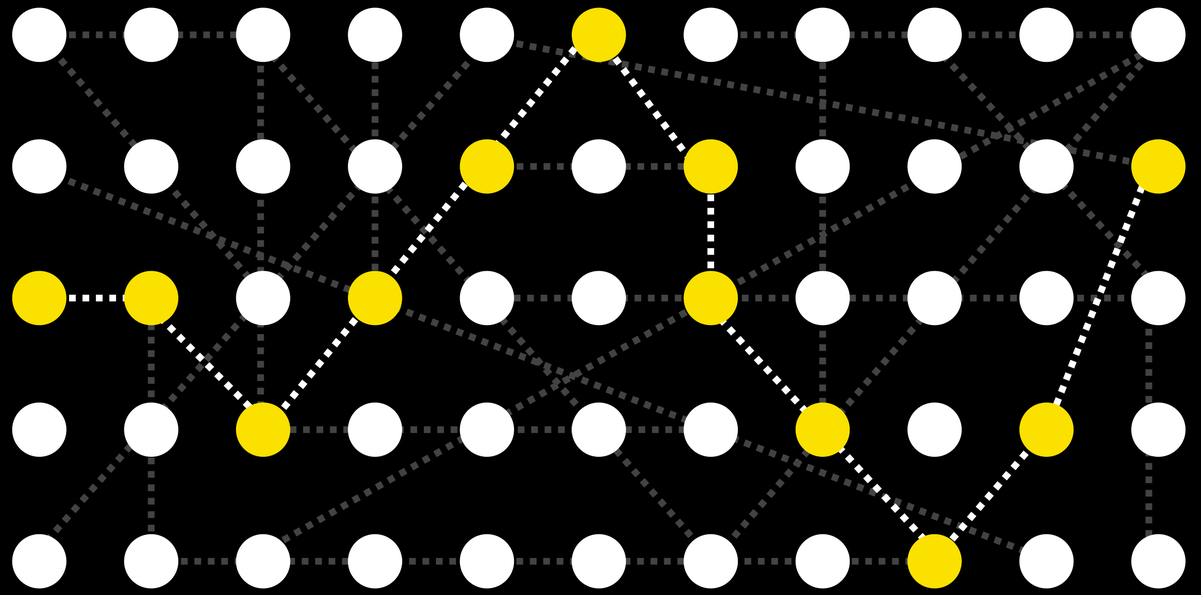
N years later..



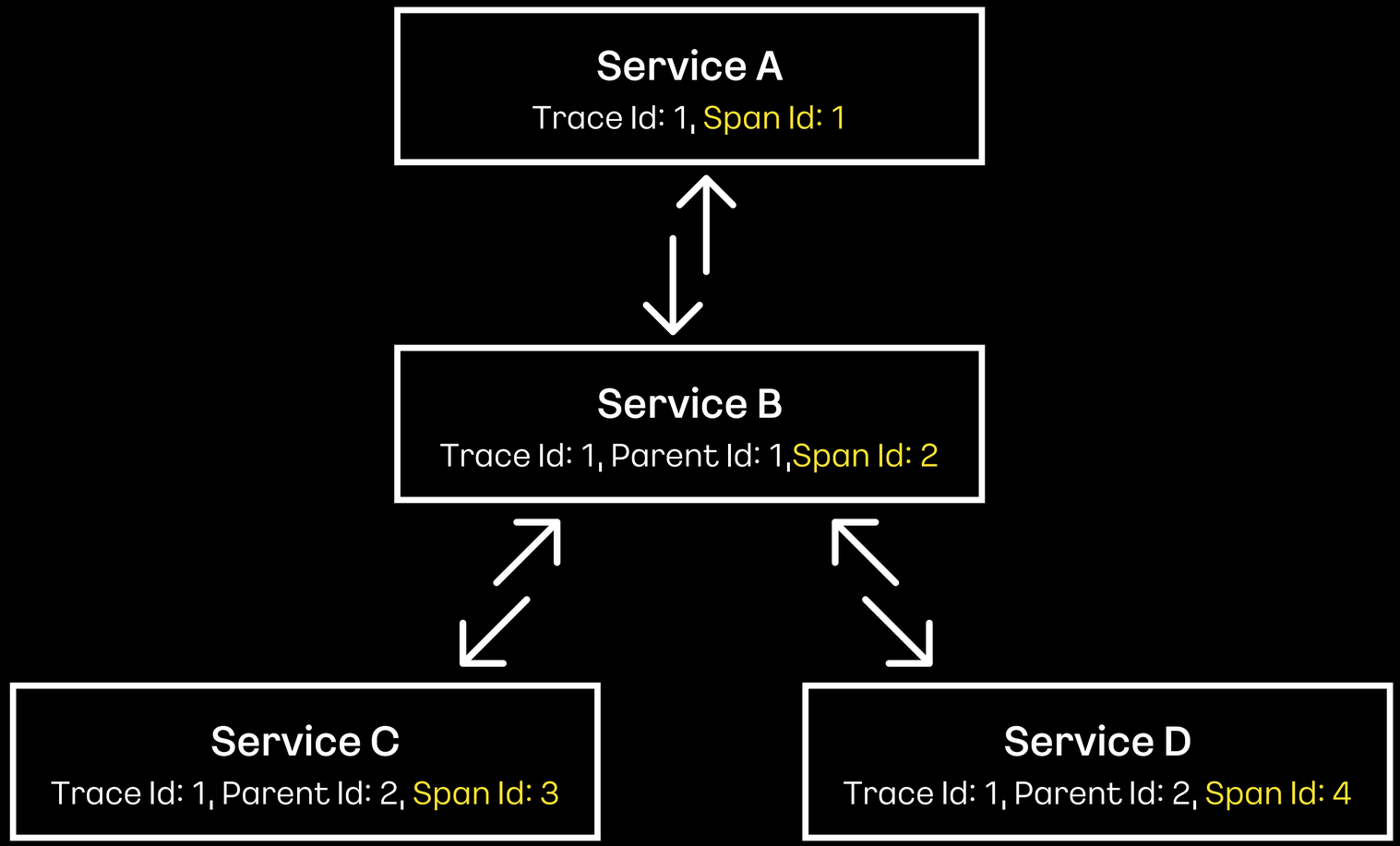
문제점

- 릴리즈 이후 시간이 지나면서 시스템이 복잡해지고 거대해짐
- 요청에 대한 네트워크 홉의 증가
- 이에 따른 이슈 파악 시간 증가
- 병목 지점 확인이 어려움
- 서비스 안정성

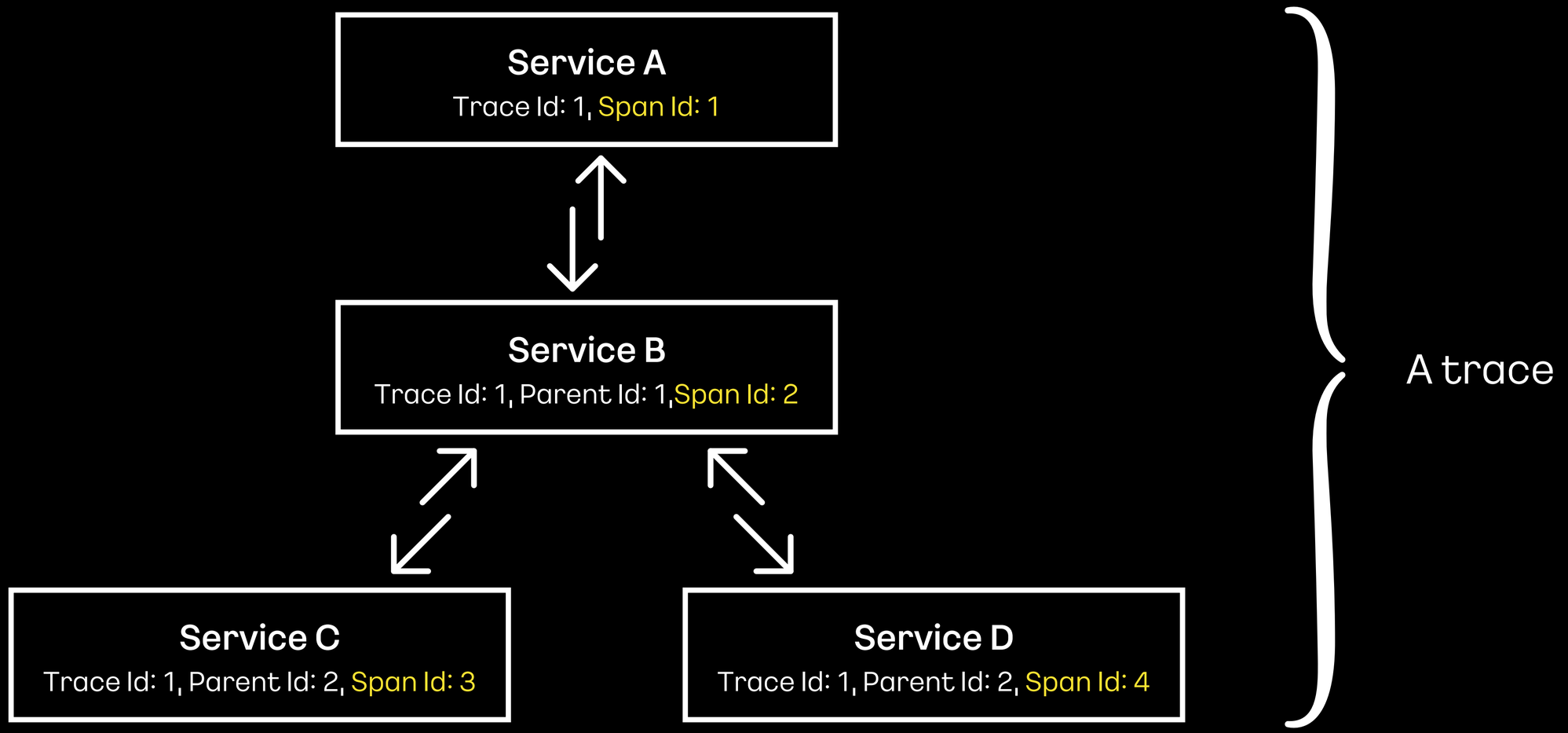
What is distributed tracing



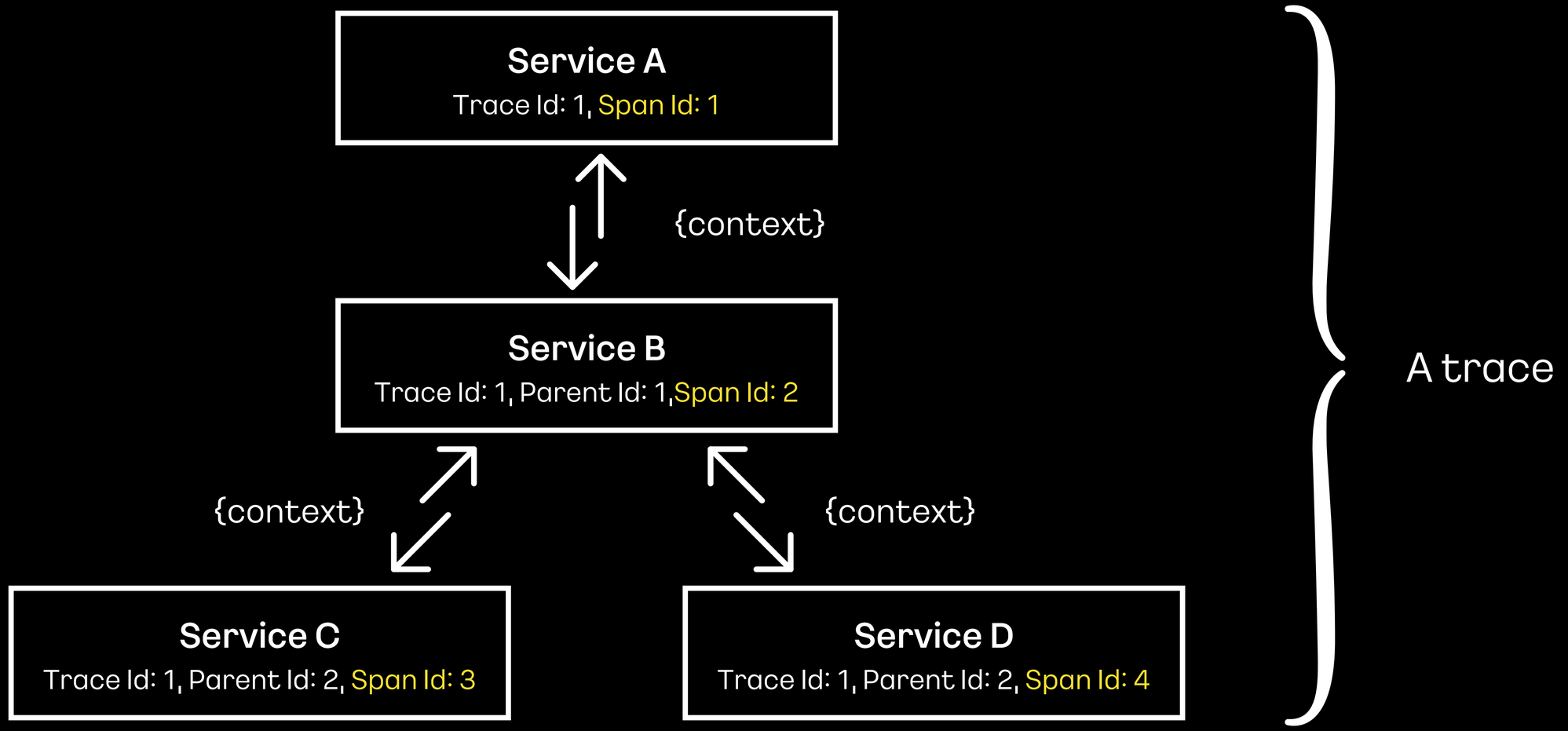
구성요소


Service A
Trace Id: 1, Span Id: 1
Service B
Trace Id: 1, Parent Id: 1,Span Id: 2
Service C
Trace Id: 1, Parent Id: 2, Span Id: 3
Service D
Trace Id: 1, Parent Id: 2, Span Id: 4

구성요소


Service A
Trace Id: 1, Span Id: 1
Service B
Trace Id: 1, Parent Id: 1,Span Id: 2
Service C
Trace Id: 1, Parent Id: 2, Span Id: 3
Service D
Trace Id: 1, Parent Id: 2, Span Id: 4
A trace

구성요소


Service A
Trace Id: 1, Span Id: 1
{context}
Service B
Trace Id: 1, Parent Id: 1,Span Id: 2
{context}
{context}
Service C
Trace Id: 1, Parent Id: 2, Span Id: 3
Service D
Trace Id: 1, Parent Id: 2, Span Id: 4
A trace

그라운드엑스와 DevOps 소개

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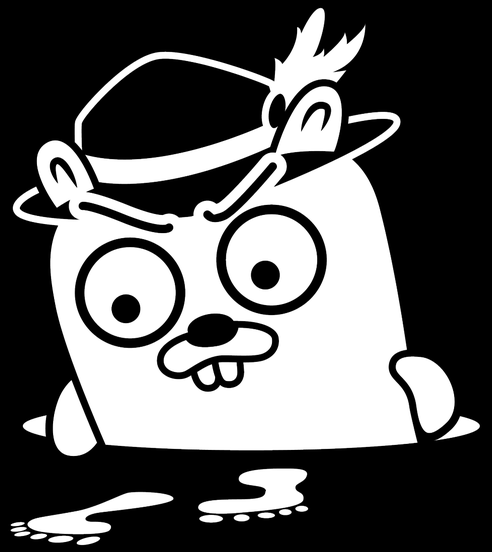
Review

Jaeger

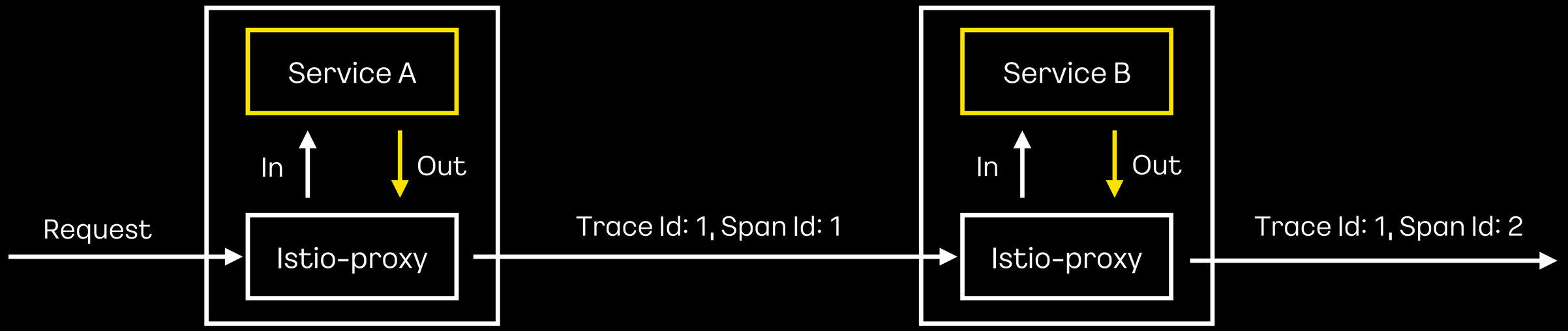


- Open source distributed tracing platform
- CNCF Graduated Project
- Good compatibility with k8s, Istio

Tuning Istio

```
apiVersion: install.istio.io/v1alpha1
kind: IstioOperator
metadata:
 name: main
 namespace: istio-system
spec:
 meshConfig:
  enableTracing: true                  // 트레이싱 활성화
  defaultConfig:
   tracing:
    sampling: 60                       // 수집할 퍼센트
    custom_tags:                       // 추가할 태그
     account_header:
      header:
       name: x-account-id
    zipkin:                            // jaeger collector의 주소
     address: jaeger-collector.observability.svc:9411
```

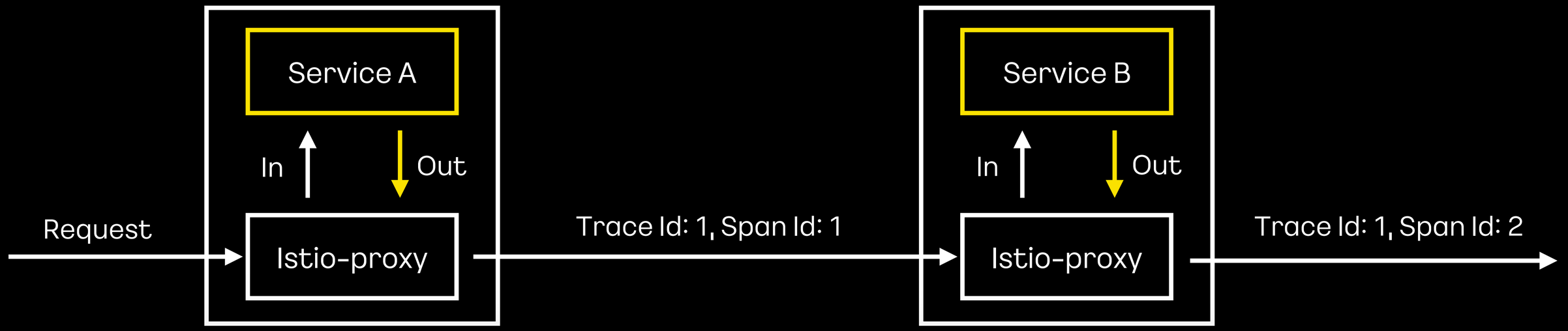
Application header propagations



Headers

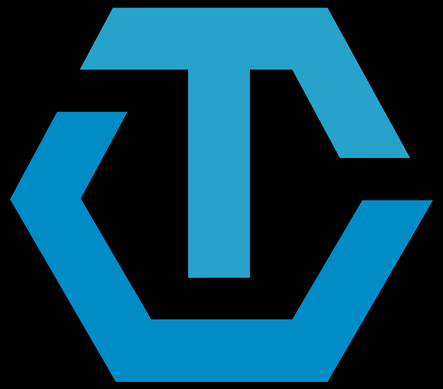
- x-request-id
- x-b3-traceid
- x-b3-spanid
- x-b3-parentspanid
- x-b3-sampled
- x-b3-flags
- x-ot-span-context

Opentracing



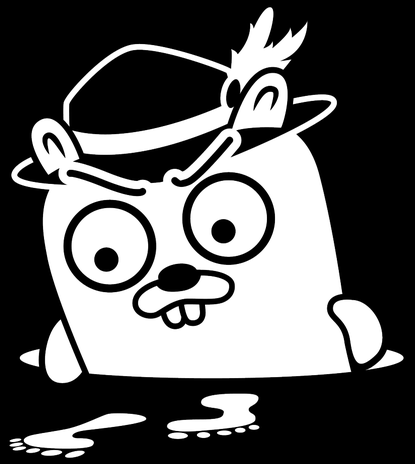

```
opentracing.GlobalTracer().Inject(
    span.Context(),
    opentracing.HTTPHeaders,
    opentracing.HTTPHeadersCarrier(httpReq.Header))

resp, err := httpClient.Do(httpReq)
```

Distributed tracing stack



Opentracing

- Tracing library
- Application



Jaeger

- Distributed tracing platform

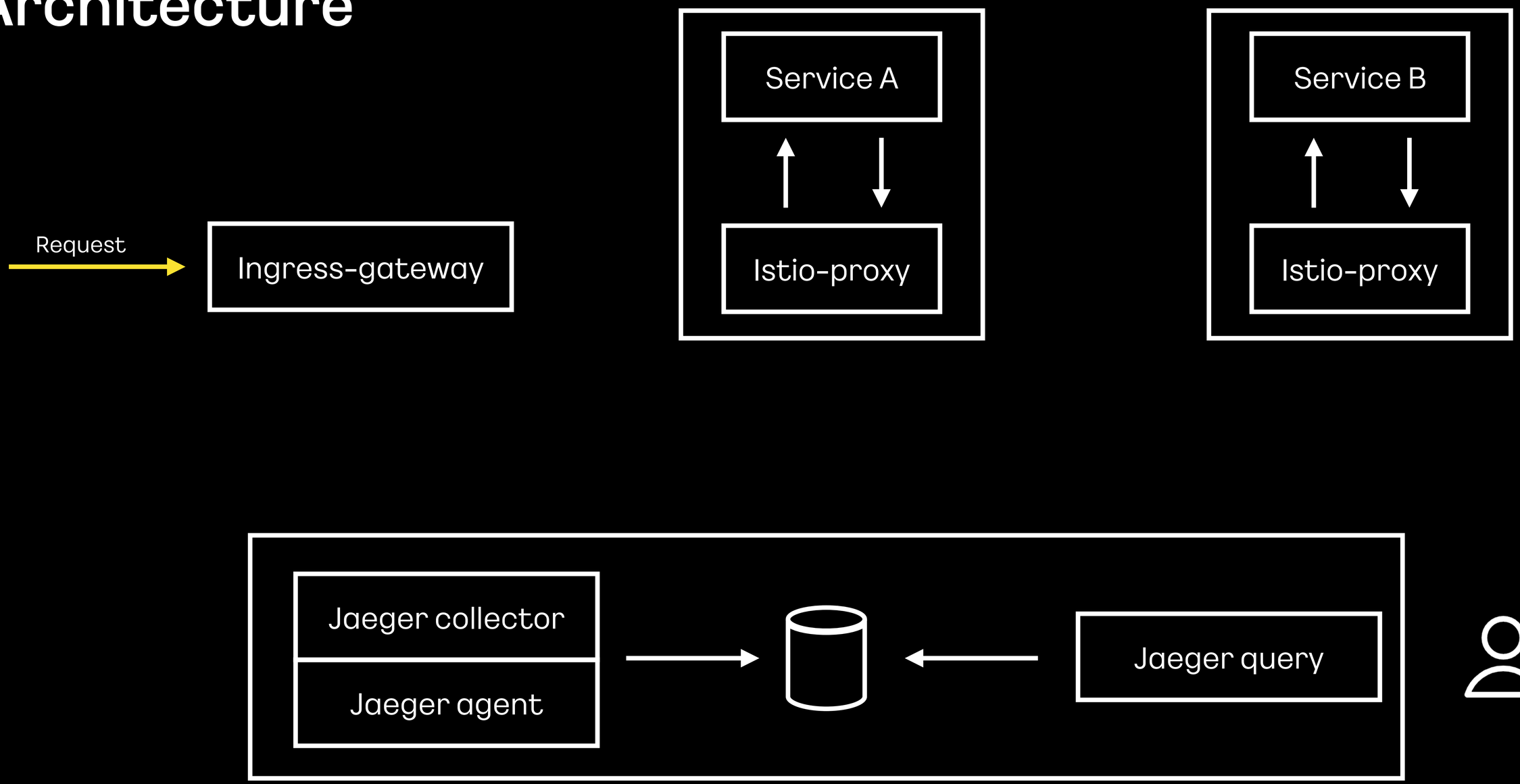
Kubernetes

- helm chart
- Jaeger Operator

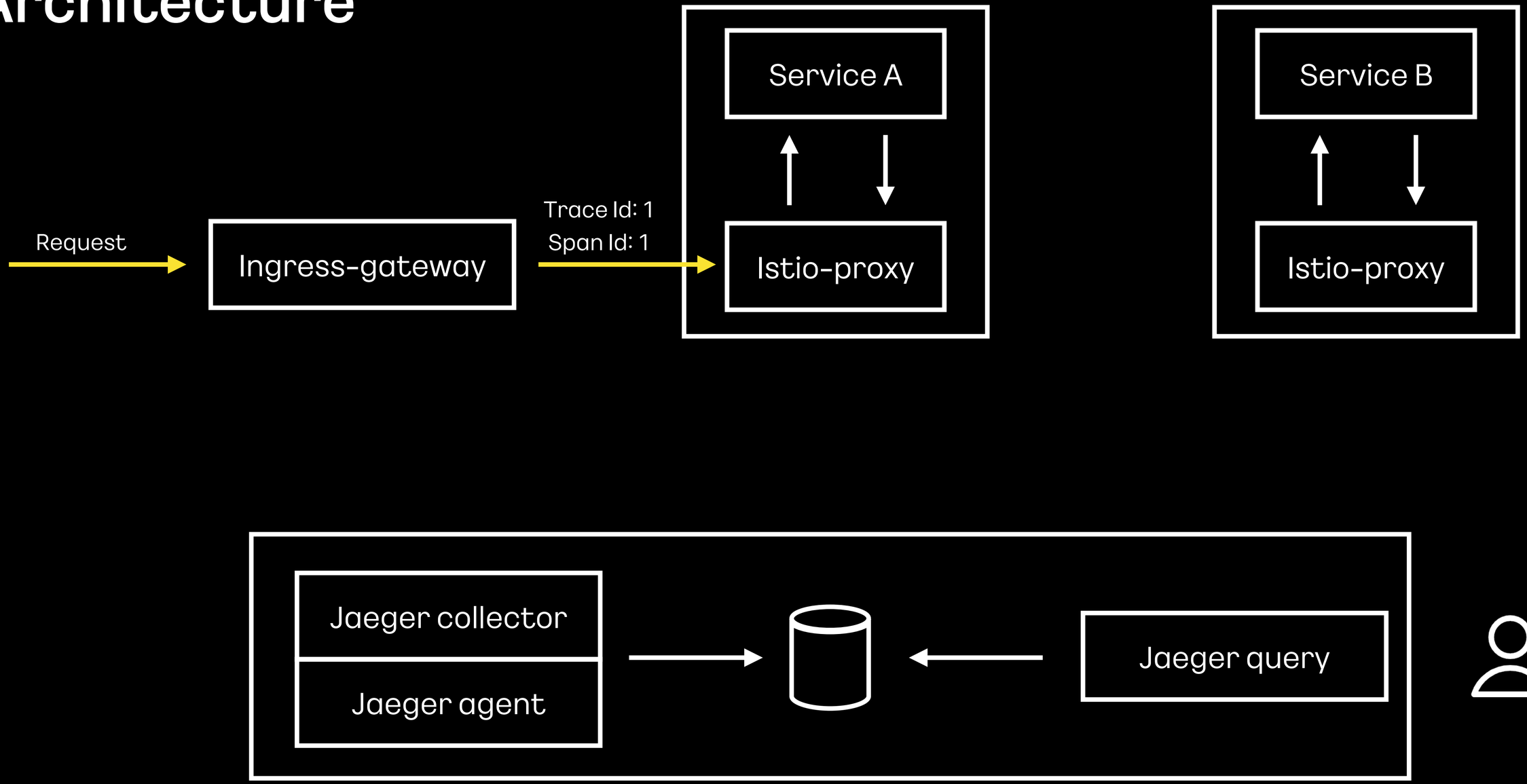
Istio

- Envoy's tracing feature
- Automatically send spans

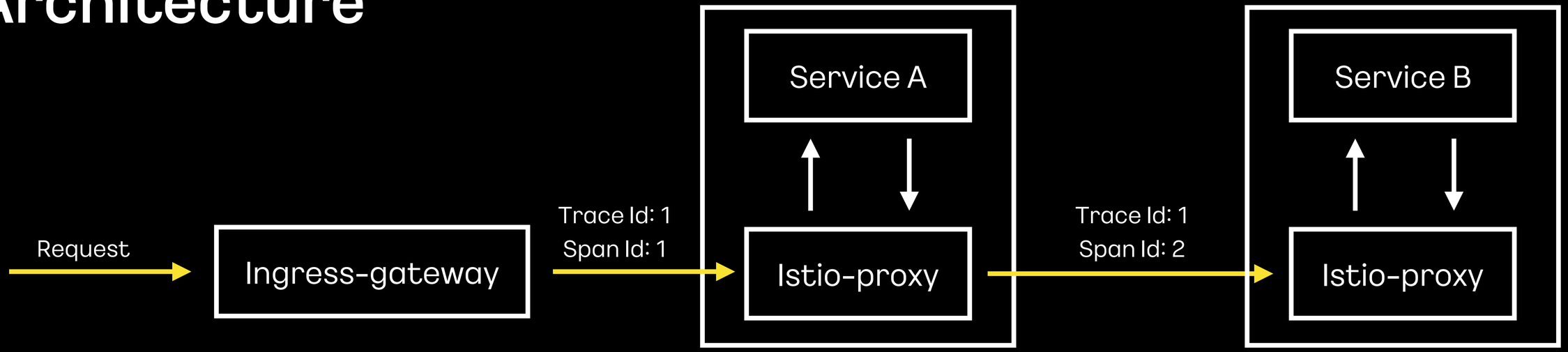
Architecture

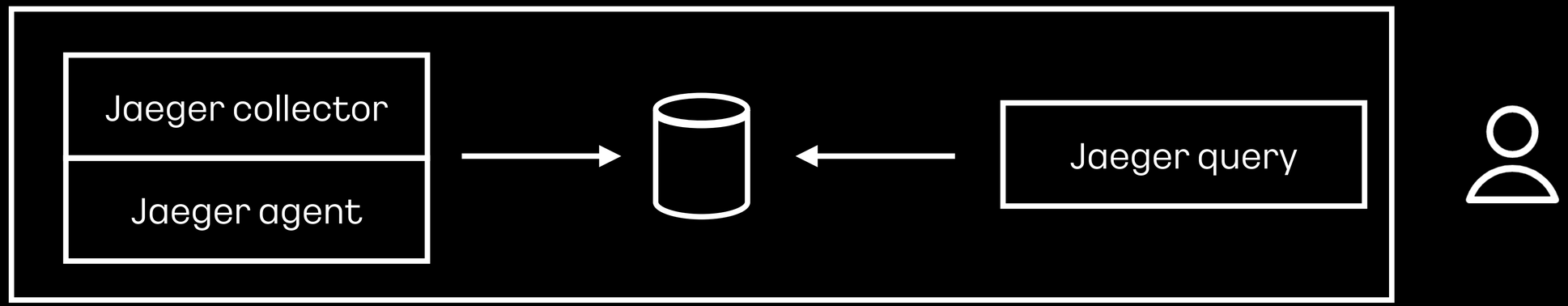


Architecture

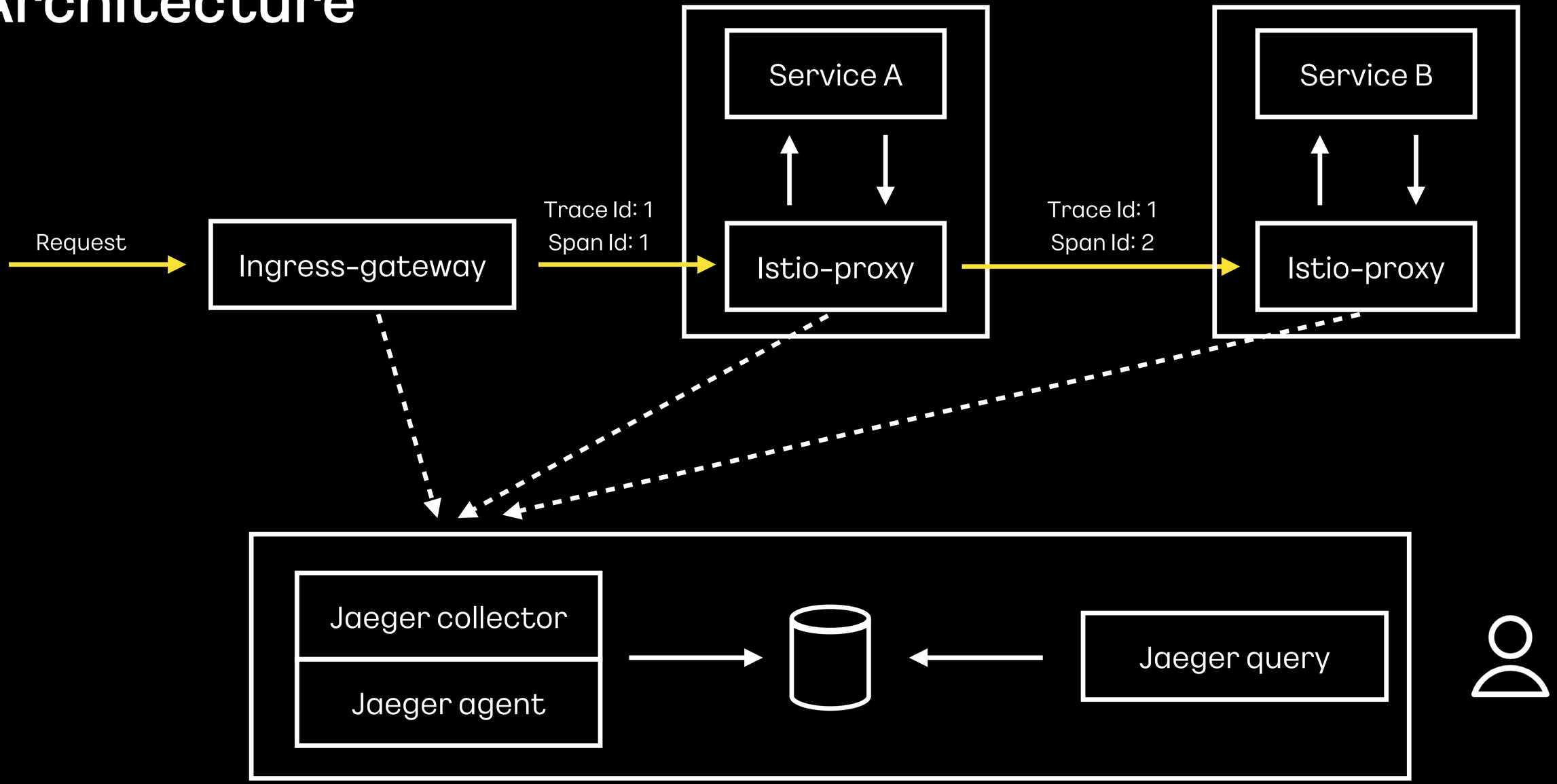


Architecture

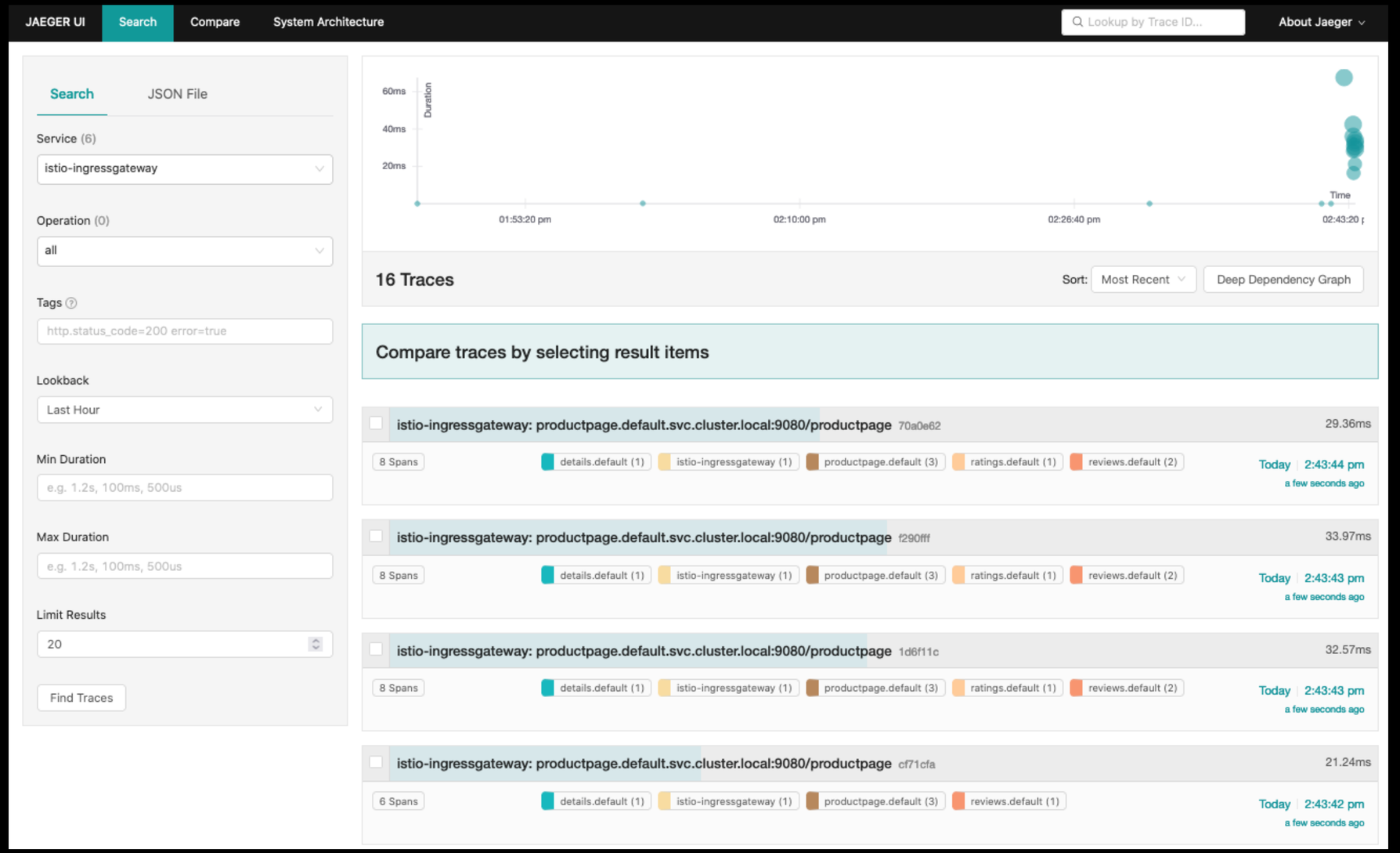




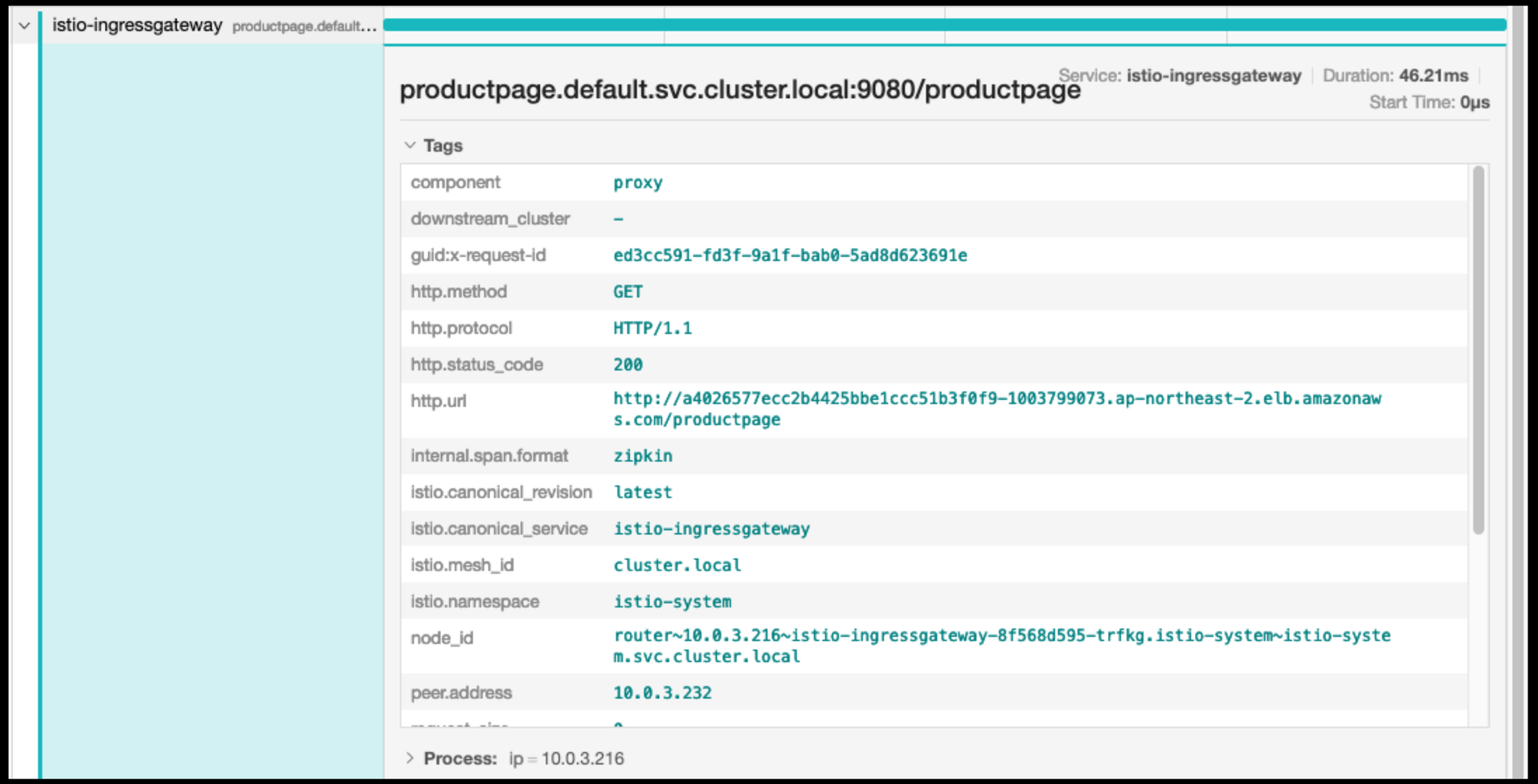
Architecture



Jaeger UI


JAEGER UI
Search
Compare
System Architecture
Lookup by Trace ID...
About Jaeger
Search
JSON File
Service (6)
istio-ingressgateway
Operation (0)
all
Tags
http.status_code=200 error=true
Lookback
Last Hour
Min Duration
e.g. 1.2s, 100ms, 500us
Max Duration
e.g. 1.2s, 100ms, 500us
Limit Results
20
Find Traces
Query
60ms
40ms
20ms
Duration
Time
01:53:20 pm
02:10:00 pm
02:26:40 pm
16 Traces
Sort:
Most Recent
Deep Dependency Graph
Compare traces by selecting result items
istio-ingressgateway: productpage.default.svc.cluster.local:9080/productpage 70a0e62
29.36ms
8 Spans
details.default (1)
istio-ingressgateway (1)
productpage.default (3)
ratings.default (1)
reviews.default (2)
Today | 2:43:44 pm
a few seconds ago
istio-ingressgateway: productpage.default.svc.cluster.local:9080/productpage f290fff
33.97ms
8 Spans
details.default (1)
istio-ingressgateway (1)
productpage.default (3)
ratings.default (1)
reviews.default (2)
Today | 2:43:43 pm
a few seconds ago
istio-ingressgateway: productpage.default.svc.cluster.local:9080/productpage 1d6f11c
32.57ms
8 Spans
details.default (1)
istio-ingressgateway (1)
productpage.default (3)
ratings.default (1)
reviews.default (2)
Today | 2:43:43 pm
a few seconds ago
istio-ingressgateway: productpage.default.svc.cluster.local:9080/productpage cf71cfa
21.24ms
6 Spans
details.default (1)
istio-ingressgateway (1)
productpage.default (3)
reviews.default (1)
Today | 2:43:42 pm
a few seconds ago

Jaeger UI


istio-ingressgateway productpage.default...
productpage.default.svc.cluster.local:9080/productpage
Service: istio-ingressgateway | Duration: 46.21ms | Start Time: 0µs
Tags
component proxy
downstream_cluster -
guid:x-request-id ed3cc591-fd3f-9a1f-bab0-5ad8d623691e
http.method GET
http.protocol HTTP/1.1
http.status_code 200
http.url http://a4026577ecc2b4425bbe1ccc51b3f0f9-1003799073.ap-northeast-2.elb.amazonaws.com/productpage
internal.span.format zipkin
istio.canonical_revision latest
istio.canonical_service istio-ingressgateway
istio.mesh_id cluster.local
istio.namespace istio-system
node_id router~10.0.3.216~istio-ingressgateway-8f568d595-trfkg.istio-system~istio-system.svc.cluster.local
peer.address 10.0.3.232
Process: ip = 10.0.3.216

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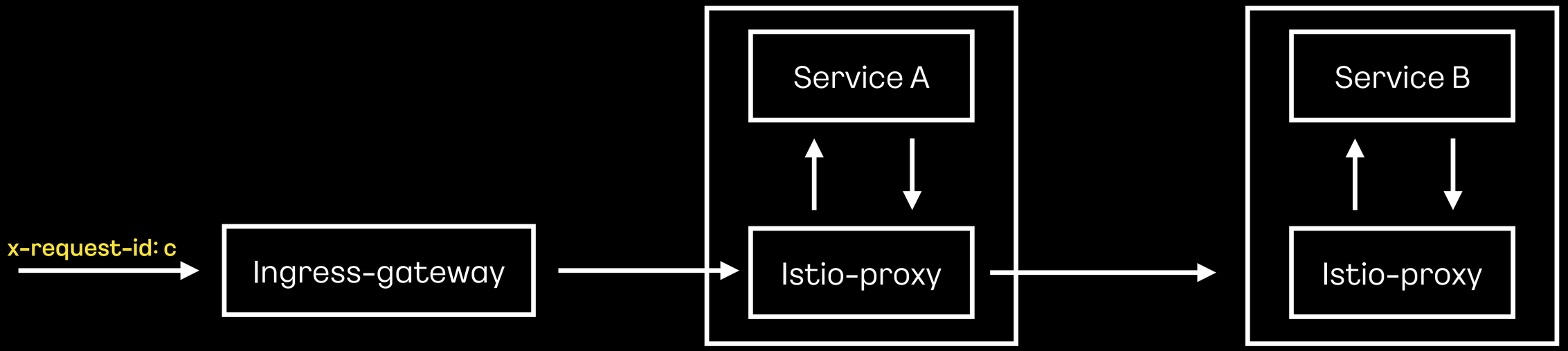
기존 디버깅 환경

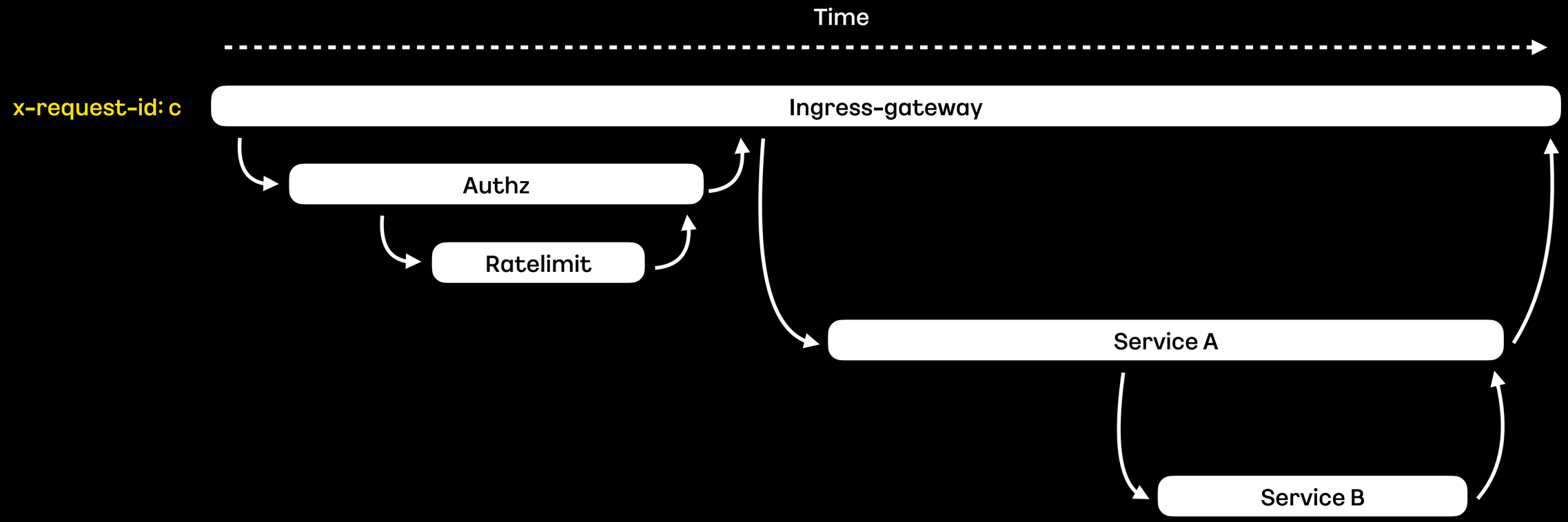


[2021-09-09] "GET /" 200 x-request-id: a
[2021-09-09] "GET /" 400 x-request-id: b
[2021-09-09] "GET /" 200 x-request-id: c
[2021-09-09] "GET /" 200 x-request-id: d
[2021-09-09] "GET /" 401 x-request-id: e
[2021-09-09] "GET /" 200 x-request-id: f
...

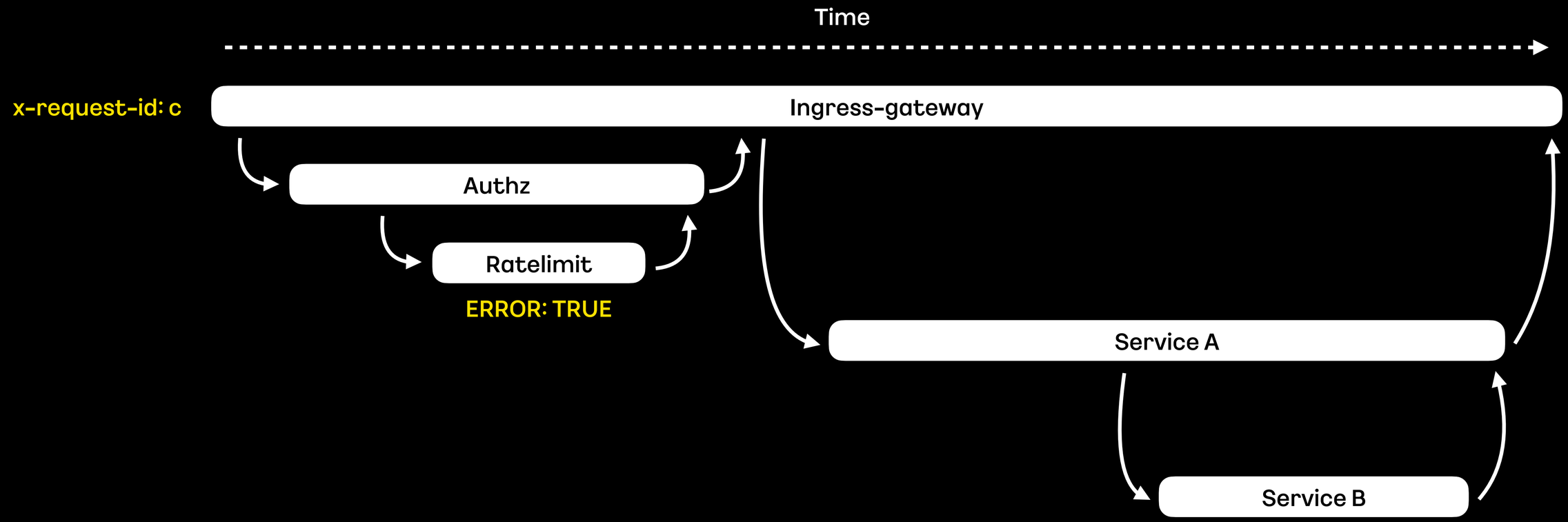
[2021-09-09] "GET /" 200 x-request-id: a
[2021-09-09] "GET /" 400 x-request-id: b
[2021-09-09] "GET /" 200 x-request-id: c
[2021-09-09] "GET /" 200 x-request-id: d
[2021-09-09] "GET /" 401 x-request-id: e
[2021-09-09] "GET /" 200 x-request-id: f
...

[2021-09-09] "GET /" 200 x-request-id: a
[2021-09-09] "GET /" 400 x-request-id: b
[2021-09-09] "GET /" 500 x-request-id: c
[2021-09-09] "GET /" 200 x-request-id: d
[2021-09-09] "GET /" 401 x-request-id: e
[2021-09-09] "GET /" 200 x-request-id: f
...

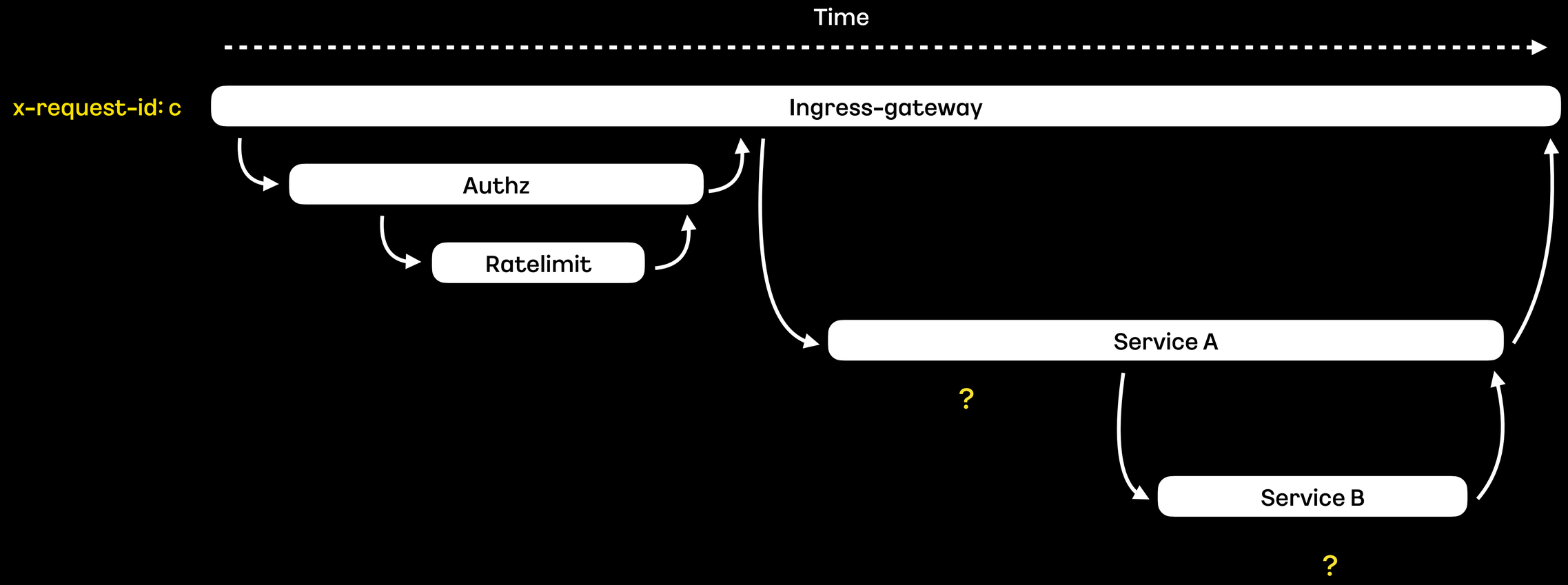
가시성 확보


Time
x-request-id: c
Ingress-gateway
Authz
Ratelimit
Service A
Service B

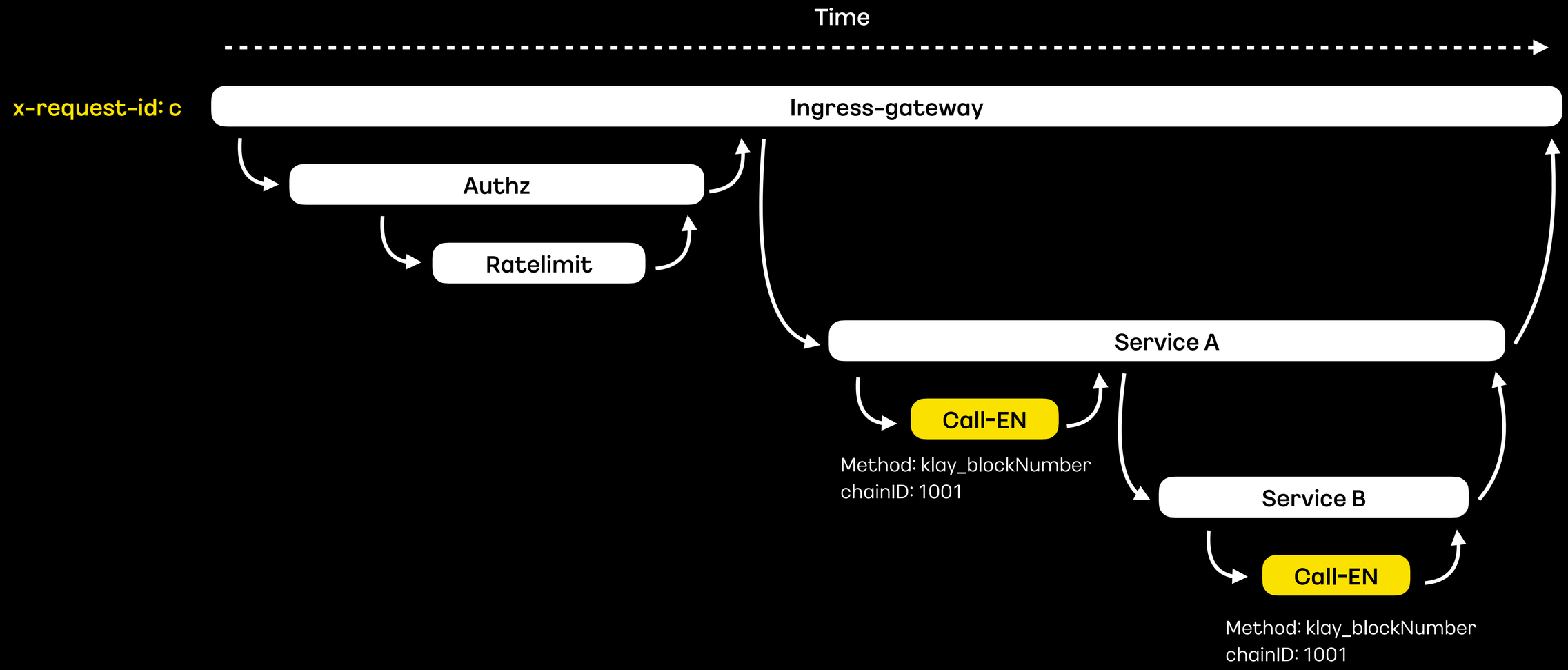
Root cause analysis



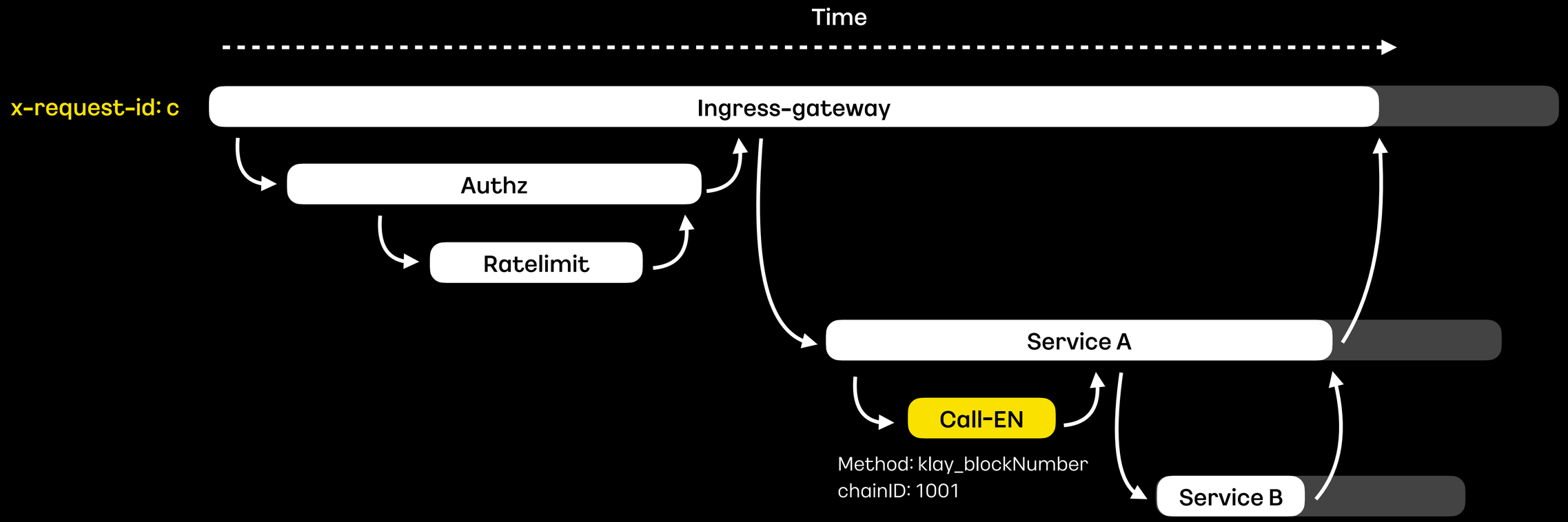
Limitation


Time
x-request-id: c
Ingress-gateway
Authz
Ratelimit
Service A
?
Service B
?

Add custom spans



Performance and latency optimization



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Pros

- 코드 변경 없이 초기 구현 가능
- 어플리케이션 성능에 영향을 최소화
- 비즈니스 로직에 집중
- 서비스 메쉬를 대부분 커버
- span에 기본적인 tags 제공

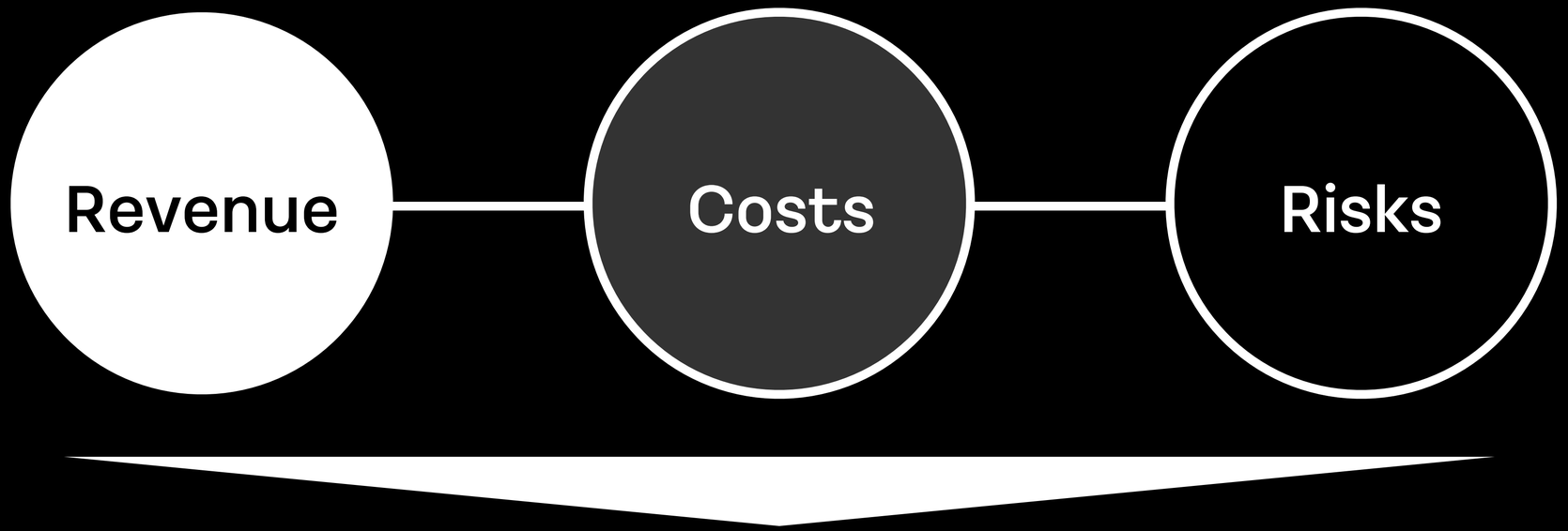
Cons

- 적은 유연성
- Span 추가나 세부적인 tag 추가가 어려움
- Sampling

Todo

- Alert과의 연동
- Tags/Logs의 스펙 고도화

Poor Monitoring & Observability



Experience

E.O.D