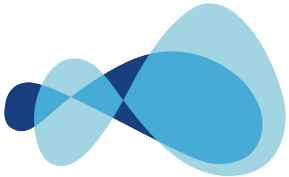
Observability in Service Mesh

Powered by Envoy and Apache SkyWalking



Sheng Wu, Lizan Zhou

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Agenda

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- What is Service Mesh?
- Envoy Overview
- Envoy Data Plane API
- Observability
- Connect Envoy and Istio to SkyWalking
- Q&A

What is Service Mesh?

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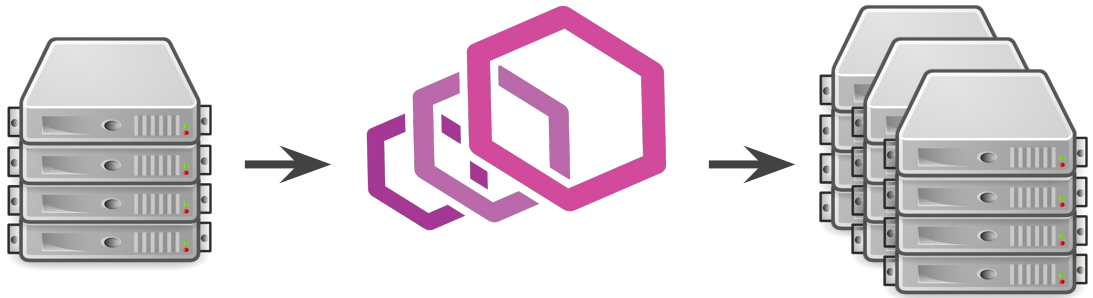
The network should be transparent to applications.

When network and application problems do occur it should be easy to determine the source of the problem.



Service mesh refresher

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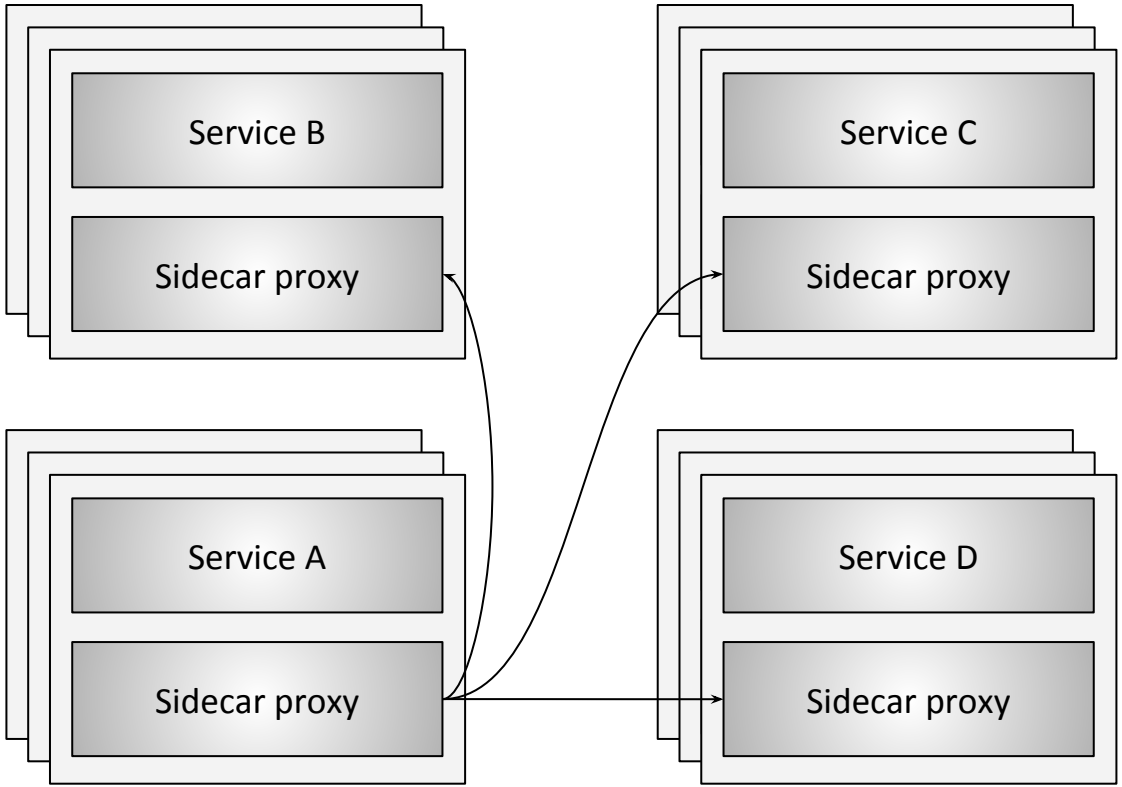

What is Envoy

- **Out of process architecture**
- **High performance / low latency code base**
- **L3/L4 filter architecture**
- **HTTP L7 filter architecture**
- **HTTP/2** first
- **Service discovery** and **active/passive health checking**
- **Advanced load balancing**
- Best in class **observability** (stats, logging, and tracing)
- **Authentication** and **authorization**
- **Edge proxy**

Envoy architecture

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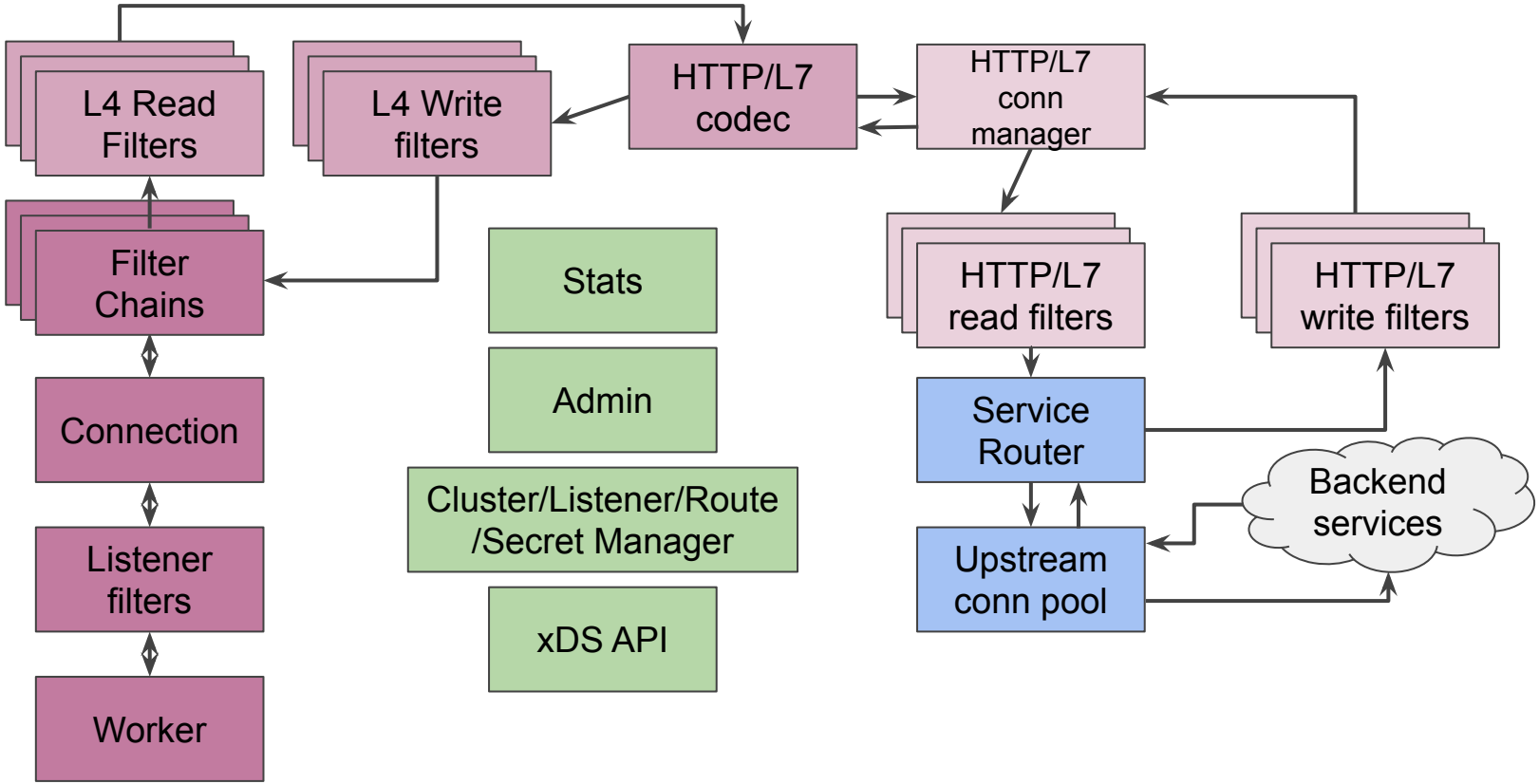

Envoy's data plane API

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- Envoy is a **universal data plane**
- xDS == * Discovery Service (various configuration APIs). where Envoy retrieve configurations from E.g.,:
  - LDS == Listener Discovery Service
  - CDS == Cluster Discovery Service
  - RDS == Route Discovery Service
- Observability
  - Metrics Service
  - Access Log Service
  - Trace Service (OpenCensus, WIP)

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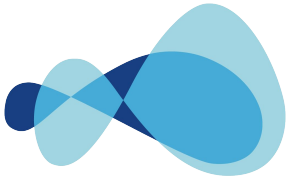
Observability



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Metrics Service


```
service MetricsService {
  // Envoy will connect and send StreamMetricsMessage messages forever. It does not expect any
  // response to be sent as nothing would be done in the case of failure.
  rpc StreamMetrics(stream StreamMetricsMessage) returns (StreamMetricsResponse) {
  }
}

message StreamMetricsMessage {
  // Identifier data effectively is a structured metadata. As a performance optimization this will
  // only be sent in the first message on the stream.
  Identifier identifier = 1;


  // A list of metric entries
  repeated io.prometheus.client.MetricFamily envoy_metrics = 2;
}
```

Access Log Service (ALS)

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```
service AccessLogService {
  rpc StreamAccessLogs(stream StreamAccessLogsMessage) returns (StreamAccessLogsResponse) {
  }
}

message StreamAccessLogsMessage {
  Identifier identifier = 1;

  // Wrapper for batches of HTTP access log entries.
  message HTTPAccessLogEntries {
    repeated envoy.data.accesslog.v2.HTTPAccessLogEntry log_entry = 1
        [(validate.rules).repeated .min_items = 1];
  }

  oneof log_entries {
    HTTPAccessLogEntries http_logs = 2;
  }
}
```

envoy-metric receiver in SkyWalking

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- Apache SkyWalking includes
  - envoy-metric receiver --- supports both Envoy Metrics service and Access log service

- Envoy configuration needed
  - Metrics Service: In bootstrap config
  - Access Log Service: In HTTP Connection Manager

Today, Istio Mixer

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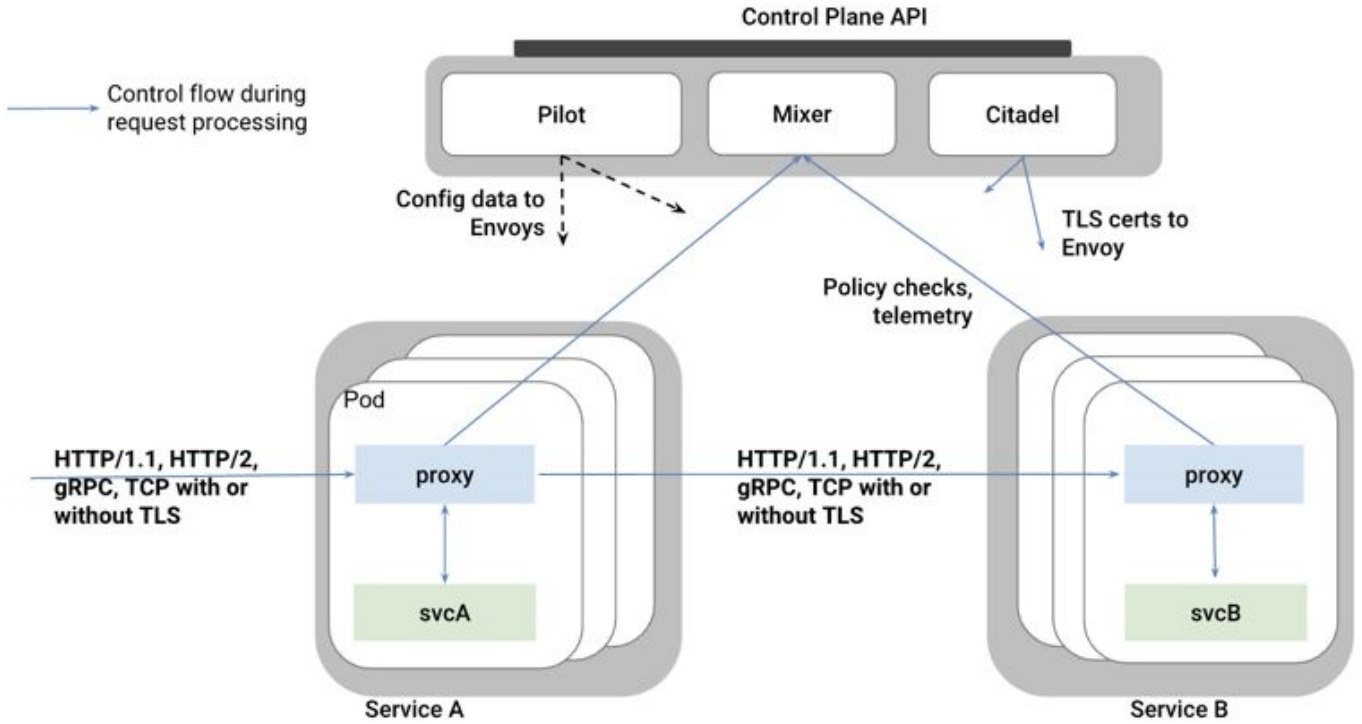

Istio + Apache SkyWalking

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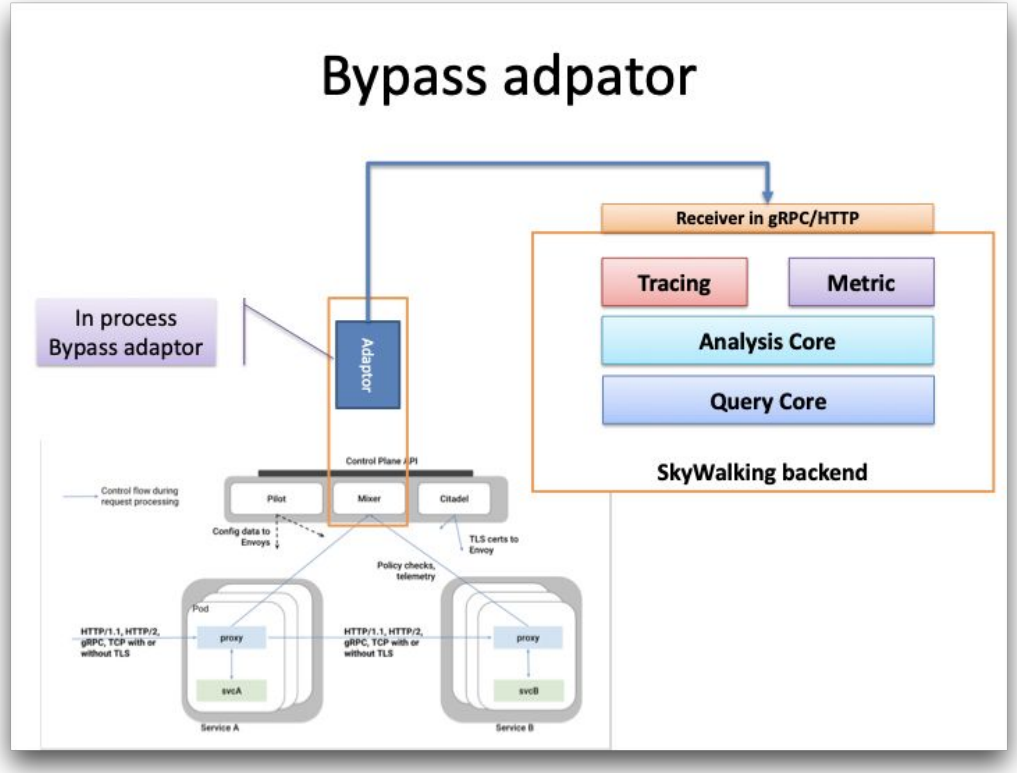

Istio Mixer Performance Concerns

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- Istio Mixer Envoy Filter Cost
  - More CPU of Envoy
  - Latency of RPC
- Istio Mixer Server Cost.
  - Unnecessary cost when using BYPASS
- Istio filter to Server
  - Complex attribute report protocol

What are the key metrics of mesh observability

- Topology
- Metrics of nodes and lines.
  - Nodes mean service.
  - Lines mean distributed dependency.

Options

1. Implement a SkyWalking filter in Envoy
2. Implement the Istio’s Attribute Protocol
3. Introduce ALS to SkyWalking

ALS of Sidecar and Ingress

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- **KEY, How to identify Envoy role.**
- **WHY?**
- **Solution, using special words of Envoy node name.**
  - **router~ -> Ingress**
  - **sidecar~ -> sidecar**
    - **OUTBOUND in** upstreamCluster **-> Client side Sidecar**
    - **INBOUND in** upstreamCluster **-> Server side Sidecar**

ALS is only working well for observability when it is controlled by Istio.

Identify NODE by IP

K8s and Istio manage service mesh

Generate Topology line

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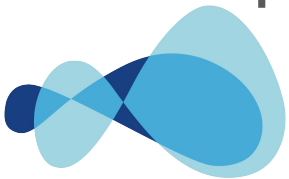
LINE of topology map has two detected points, client side and server side

- Ingress
  - Incoming request(server side): downstreamRemoteAddress -> downstreamLocalAddress
  - Outgoing request(client side): downstreamLocalAddress -> upstreamRemoteAddress
- Server Side sidecar
  - ingress -> sidecar(server side): Don’t generate, can’t identify downstreamRemoteAddress
  - sidecar -> sidecar(server side): downstreamRemoteAddress -> downstreamLocalAddress
- Client Side sidecar
  - sidecar(client side) -> sidecar: downstreamRemoteAddress -> upstreamRemoteAddress

Implementation Open Source in Apache SkyWalking

Project repo, https://github.com/apache/skywalking



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Q&A

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- Thanks for coming!
- https://envoyproxy.io/
- https://skywalking.apache.org/
- Talk to us if you need help getting started with Envoy and/or Apache SkyWalking.
- **Tetrate is hiring**: Contact us if you want to work on the problems and solutions based on Service Mesh.