Observability in Service Mesh
Powered by Envoy and Apache SkyWalking
Agenda

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

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

Service A
- Sidecar proxy

Service B
- Sidecar proxy

Service C
- Sidecar proxy

Service D
- Sidecar proxy
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's data plane API

- 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**
  - Metrics Service
  - Access Log Service
  - Trace Service (OpenCensus, WIP)
Observability
Metrics Service

```protobuf
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)

```protobuf
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 = 1];
    }

    oneof log_entries {
        HTTPAccessLogEntries http_logs = 2;
    }
}
```
envoy-metric receiver in SkyWalking

- 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
Istio + Apache SkyWalking
Istio Mixer Performance Concerns

- 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

➢ 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

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
Q&A

- Thanks for coming!
- [https://envoyproxy.io/](https://envoyproxy.io/)
- [https://skywalking.apache.org/](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.