KubeCon CloudNativeCon
Europe 2022

Intro and Deep Dive

CNCF TAG Network & CNCF Service Mesh WG

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CNCF TAG Network

Introduction

Mission Statement

With an ever steady eye to the needs of workloads and developers who create them and operators who run them, TAG Network's mission is to enable widespread and successful development, deployment and operation of resilient and intelligent network systems in cloud native environments.

In this endeavor, we seek to:

1. Clarify and inform.
2. Collaborate and interrelate.
3. Assist and attract projects.
4. Afford impartial stewardship.

CNCF TAG Network Projects

KubeCon NA 2019

- CNI
- CoreDNS
- Envoy
- gRPC
- Linkerd
- NATS
- Network Service Mesh

KubeCon EU 2020

- BFE
- CNI-Genie
- Contour
- Kuma
- Service Mesh Interface

As of KubeCon NA 2020

- Chaos Mesh
- Open Service Mesh

As of KubeCon EU 2021

- Emissary Ingress
- k8gb

KubeCon NA 2021

- Service Mesh Performance
- Submariner
- Cilium
- Meshery

KubeCon China 2021

- FabEdge

KubeCon EU 2022

- Proposed: Istio

Working Groups and Papers

Working Groups

- Universal Data Plane API
- Service Mesh Working Group

Whitepapers

- Cloud Native Networking Principles proposed for incorporation into TAG Network.
- Service Mesh Patterns and Reference Implementation

- Analyzing Service Mesh Performance

Future:

- Techniques of Adaptive Service Mesh Optimization

Service Mesh Working Group

Deep-Dive

Service Mesh Specifications

It's a multi-mesh world

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Service Mesh Interface (SMI)

A standard **interface** for service meshes on Kubernetes.

Service Mesh Performance (SMP)

A standard for describing and capturing service mesh **performance**.

Multi-Vendor Service Mesh Interoperation (Hamlet)

A set of API standards for enabling service mesh **federation**.

to be determined

Service Mesh Interface Conformance

Validating compliance

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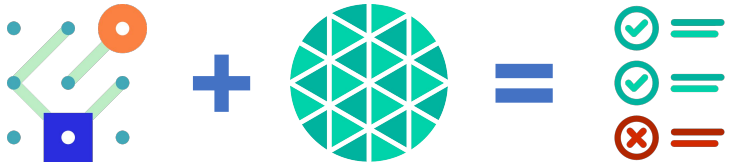

meshery.io/smi

Purpose and Scope

- Provide an easy-to-use, service mesh and SMI-specific tool to give service mesh projects and users a suite of repeatable conformance tests.
- All service mesh projects participating in the Service Mesh Interface specification.

Project Goals

- Provide users with a compatibility matrix identifying the SMI features that are supported per service mesh.

Project Objectives

- Define a set of conformance tests and what behavior is expected of a conforming service mesh implementation.
- Built into each participating service mesh project's release tooling.

Validating Conformance

- Conformance to SMI specifications will be done through use of a service mesh's workload.
- A sample application is used as the workload to test: Learn Layer5

Reference: Design spec and Overview

Service Mesh Patterns

Enabling use of repeatable architectural patterns

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github.com/service-mesh-patterns

Service Mesh Patterns enable the business function in simple language.

- Patterns **capture service mesh behavior** in a single file and an end-user centric way.

Service Mesh Patterns are service mesh agnostic.

- But, still allow users access service mesh-specific features and **differentiation**.
  - User ability to filter on service mesh compatibility..

Service Mesh Patterns are reusable.

- Not only are patterns idempotent, but you can easily copy a pattern and modify to suit.
- Imbued with **best practices.**
- Pattern components can be interchanged and used as building blocks, combining multiple components into a new, integrated pattern.

Service Mesh Catalog

Discover and publish reusable resources

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meshery.io/catalog

WASM Filters

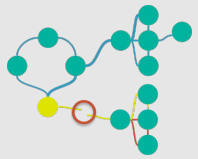
TRAFFIC MGMT
Singleton Queue
WEBASSEMBLY
MESHERY023

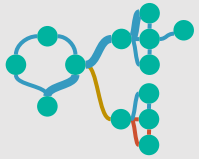
SECURITY
Sesion Authorizer
WEBASSEMBLY
MESHERY019

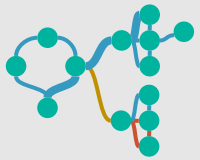
TRAFFIC MGMT
JWT Transformer
WEBASSEMBLY
MESHERY034

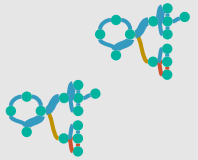
OBSERVABILITY
HTTP Metrics
WEBASSEMBLY
MESHERY028

Service Patterns

TRAFFIC MGMT
Circuit Breaker

MESHERY003

RESILIENCY
Retries

MESHERY012

SECURITY
Mutual TLS

MESHERY014

DEPLOYMENT
Multi-Cluster

MESHERY013

eBPF Programs

Coming Soon

OBSERVABILITY
L7 Traces
MESHERY045

SECURITY
L7 Denial

MESHERY046

RESILIENCY
Retry Deadline

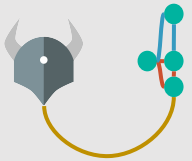
MESHERY044

DEPLOYMENT
Node Agent

MESHERY043

OPA Policies

Coming Soon

OBSERVABILITY
Correlate Event

MESHERY055

SECURITY
Single Tenant

MESHERY059

RESILIENCY
Only w/Agent

MESHERY057

DEPLOYMENT
Pre-provision

MESHERY056

Service Mesh Performance

vendor neutral service mesh performance measurement standard

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smp-spec.io

Directly enables:

- capturing details of infrastructure capacity, service mesh configuration, and workload metadata.

Facilitates:

- benchmarking of service mesh performance
- exchange of performance information from system-to-system / mesh-to-mesh
- apples-to-apples performance comparisons of service mesh deployments.
- a universal performance index to gauge a service mesh's efficiency against deployments in other organizations' environments.

MeshMark

Cloud Native Value Measurement

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smp-spec.io/meshmark

An open index for measuring performance of cloud native infrastructure in context of the value provided to your business.

A Cloud Native TCO

- MeshMark distills a variety of overhead signals and key performance indicators into a simple index.
- MeshMark's purpose is to convert measurements into insights about the value of functions your cloud native infrastructure is providing.
- MeshMark specifies a uniform way to analyze and report on the degree to which measured performance provides business value.

Attend: ServiceMeshCon session on MeshMark

MeshMark

Cloud Native Value Measurement

$$\text{MeshMark} = \frac{\frac{[\text{Utilization Class1 (MUE1 x weight) ... + (MUEn x weight)}}{\text{\# of MUEs}]} \; \text{... + ...} \; \frac{[\text{Utilization ClassN (MUE1 x weight) ... + (MUEn x weight)}}{\text{\# of MUEs}]}}{\text{\# of Utilization Classes}}$$

where weight in range -50% : +50%

Utilization Classes group MUEs by similarity of resource being measured.

Attend: ServiceMeshCon session on MeshMark

Nighthawk

Distributed systems require distributed analysis

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getnighthawk.dev

Problem:

- Many performance characterizing tools are limited to single instance load generator. This limits the amount of traffic and the variety of behavioral analysis.
- Distributed load testing in parallel poses a challenge when merging results without losing the precision we need to gain insight into the high tail percentiles.
- How to model your service mesh topology and optimize for your ideal configuration in context of how much you value properties of resiliency, performance, throughput, latency, and so on before you deploy to production.

Nighthawk

- a Layer 7 performance characterization tool created by Envoy project.
- a load generator custom-built for data plane proxy testing.

+

Meshery

- the service mesh management plane
- supports wrk2, fortio, and Nighthawk as single instance load generators.

=

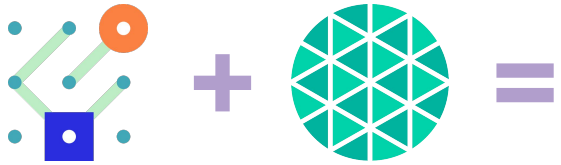
Distributed load testing offers insight into system behaviors that arguably more accurately represent real world behaviors of services under load as that load comes from any number of sources.

Explore how Nighthawk adaptive load controllers in the service mesh management plane, Meshery, offer ongoing insight and optimization.

Cross-Project Initiatives

Collaborating across projects to achieve common goals

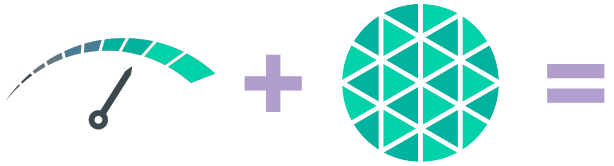
Service Mesh Interface Conformance



50 Tests

meshery.io/smi

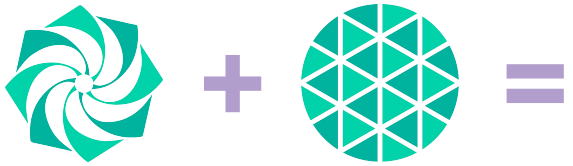
Service Mesh Performance



40,000 Tests

smp-spec.io/dashboard

Service Mesh Patterns



60 Patterns

meshery.io/catalog

CALL FOR PARTICIPATION

- Meet: 1st and 3rd Thursday of every month at 11am Pacific.
- Join: TAG Network and Service Mesh WG mailing lists at lists.cncf.io
- Connect: Slack Channel (#tag-network).
- Offer Agenda: meeting minutes.