

ChaosMesh

Introduction

ChaosMesh is an open-source chaos engineering platform that is designed to help developers and site reliability engineers (SREs) test the resiliency of their systems by simulating different types of failures and scenarios. Chaos engineering is a practice of intentionally injecting failures or disruptions into a system to test its resiliency and ability to recover.

Project Summary

Website	https://chaos-mesh.org/
Organization/Foundation Name	Linux Foundation
License	Apache License 2.0
Open/Proprietary	Open
Source Path(if open source)	gh repo clone chaos-mesh/chaos-mesh
Brief Description	<p>ChaosMesh provides a range of features that can simulate various types of failures, such as network failures, file system errors, resource exhaustion, and many others. The platform is highly customizable and can be integrated with different types of applications and infrastructure setups.</p> <p>ChaosMesh is developed by the Chaos Engineering Working Group of the Cloud Native Computing Foundation (CNCF) and is licensed under the Apache License, Version 2.0.</p>

Project Details

Key Features

Customizable Chaos Experiments: ChaosMesh provides a range of built-in chaos experiments that can simulate different types of failures and disruptions. However, users can also create their own custom experiments tailored to their specific system architecture and failure scenarios.

Kubernetes Native: ChaosMesh is built specifically for Kubernetes environments and can be easily integrated with Kubernetes-based applications and infrastructure setups. It uses Kubernetes CRDs (Custom Resource Definitions) to manage chaos experiments and control the chaos injection process.

Highly Configurable: ChaosMesh allows users to configure a wide range of parameters for their chaos experiments, such as duration, frequency, and scope of the experiment. This makes it possible to test different failure scenarios and resiliency strategies in a controlled and reproducible manner.

Comprehensive Observability: ChaosMesh provides a range of observability features that allow users to monitor the impact of chaos experiments on their system. This includes metrics and logs that can help users identify the root cause of failures and assess the effectiveness of their resiliency strategies.

Integration with CI/CD Pipelines: ChaosMesh can be integrated with CI/CD pipelines to automate the process of running chaos experiments as part of the testing and deployment process. This can help identify potential failure scenarios early in the development process and ensure that the system is resilient to different types of disruptions.

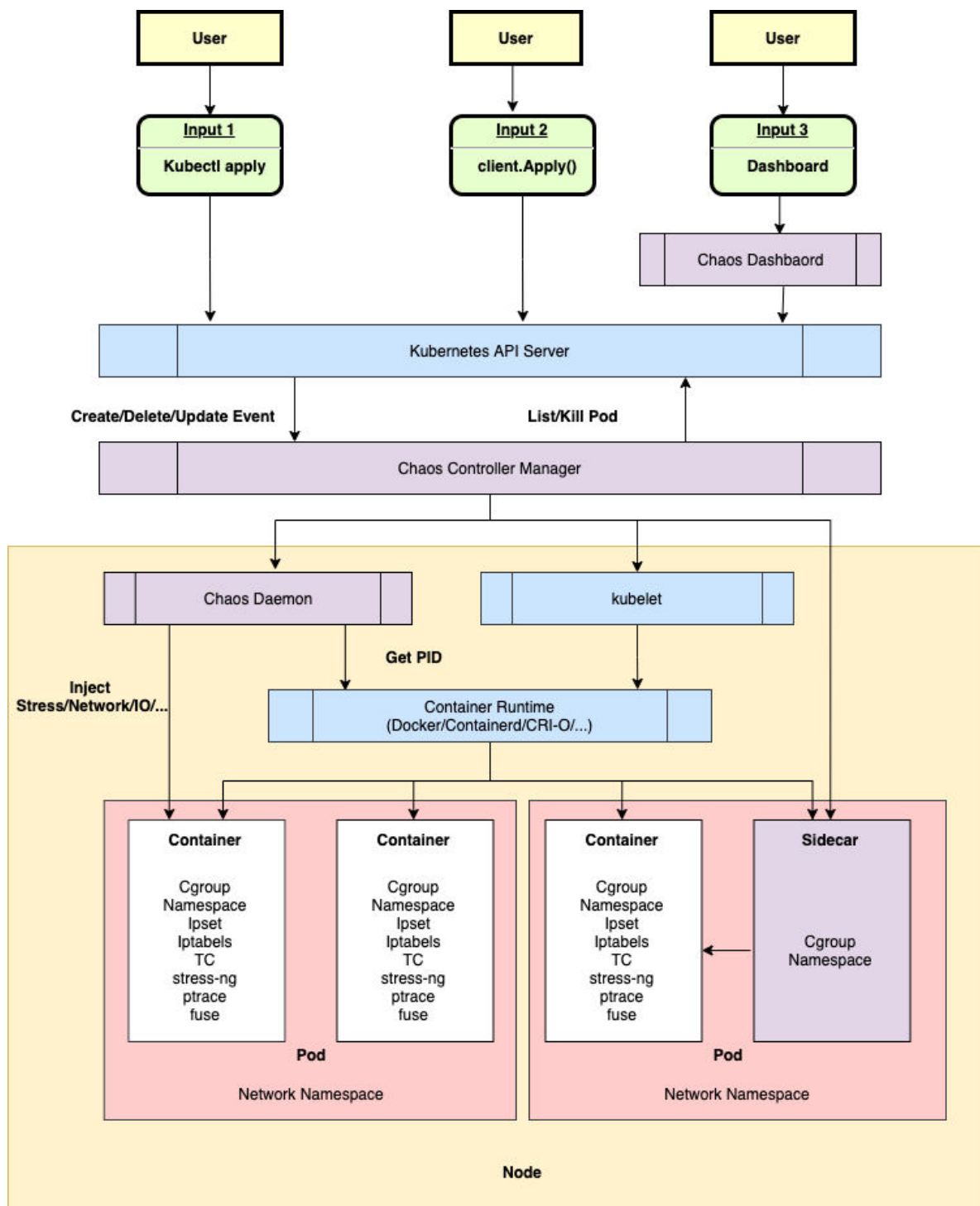
Architecture

Chaos Mesh is built on Kubernetes CRD (Custom Resource Definition). To manage different Chaos experiments, Chaos Mesh defines multiple CRD types based on different fault types and implements separate Controllers for different CRD objects. Chaos Mesh primarily contains three components:

Chaos Dashboard: The visualization component of Chaos Mesh. Chaos Dashboard offers a set of user-friendly web interfaces through which users can manipulate and observe Chaos experiments. At the same time, Chaos Dashboard also provides an RBAC permission management mechanism.

Chaos Controller Manager: The core logical component of Chaos Mesh. Chaos Controller Manager is primarily responsible for the scheduling and management of Chaos experiments. This component contains several CRD Controllers, such as Workflow Controller, Scheduler Controller, and Controllers of various fault types.

Chaos Daemon: The main executive component. Chaos Daemon runs in the DaemonSet mode and has the Privileged permission by default (which can be disabled). This component mainly interferes with specific network devices, file systems, kernels by hacking into the target Pod Namespace.



Current Usage

Alibaba: Alibaba, the Chinese multinational e-commerce giant, uses Chaos Mesh to test the resiliency of its cloud infrastructure and identify potential vulnerabilities.

JD.com: JD.com, another Chinese e-commerce company, uses Chaos Mesh to simulate network latency and packet loss to improve the performance and reliability of its systems.

ByteDance: ByteDance, the parent company of popular social media apps like TikTok and Douyin, uses Chaos Mesh to test the resiliency of its infrastructure and improve the reliability of its services.

DiDi Chuxing: DiDi Chuxing, the Chinese ride-hailing company, uses Chaos Mesh to simulate various kinds of failures in its systems and improve the reliability of its services for customers.

PingCAP: PingCAP, a Chinese cloud-native database company, uses Chaos Mesh to test the resiliency of its distributed database systems and identify potential issues before they cause significant problems.

Technical Details

Chaos Mesh is an open-source Chaos Engineering platform that allows users to test the resiliency of their systems and applications by injecting various types of failures and disruptions.

In terms of scalability, Chaos Mesh is designed to be highly scalable and can be easily deployed in large-scale environments. It supports both horizontal and vertical scaling, which means that users can add more nodes to the cluster or increase the resources of existing nodes to handle more workloads.

Regarding performance, Chaos Mesh is optimized to minimize the overhead caused by chaos experiments. It achieves this by using lightweight and efficient fault injection techniques such as kernel-level fault injection and network emulation. Additionally, Chaos Mesh provides a variety of performance metrics and monitoring tools that allow users to track the impact of chaos experiments on their systems.

Chaos Mesh also offers several other technical features, including:

Flexibility: Chaos Mesh supports a wide range of failure scenarios and can be easily customized to suit specific use cases.

Kubernetes-native: Chaos Mesh is built on top of Kubernetes and leverages its powerful orchestration capabilities to manage and control chaos experiments.

Easy to use: Chaos Mesh provides a user-friendly web UI and CLI tools that make it easy to configure and run chaos experiments.

Observability: Chaos Mesh provides detailed logs and metrics that allow users to monitor the behavior of their systems during chaos experiments and analyze the impact of failures on their applications.

Overall, Chaos Mesh is a robust and flexible Chaos Engineering platform that provides excellent scalability, performance, and observability features.

Project comparison

There are several similar projects to Chaos Mesh that are designed to help users perform Chaos Engineering experiments. Some of the most popular ones include:

Gremlin: Gremlin is a commercial Chaos Engineering platform that allows users to simulate a wide range of failure scenarios and disruptions across their systems and applications.

LitmusChaos: LitmusChaos is an open-source Chaos Engineering platform that is built on top of Kubernetes. It provides a framework for users to define and run chaos experiments on their Kubernetes clusters.

Pumba: Pumba is an open-source Chaos Engineering tool that allows users to inject various types of network and filesystem failures into their Docker containers.

Chaos Monkey: Chaos Monkey is an open-source tool that was developed by Netflix to test the resiliency of their systems. It randomly terminates instances and services in their production environment to ensure that their systems can handle failures gracefully.

Chaos Toolkit: Chaos Toolkit is an open-source toolkit for Chaos Engineering that allows users to define and run chaos experiments on their systems and applications. It supports a wide range of platforms and systems, including Kubernetes, AWS, and Docker.

These tools provide similar functionality to Chaos Mesh and are designed to help users improve the resiliency and reliability of their systems through Chaos Engineering practices.

Any other information

Chaos Mesh is an open-source Chaos Engineering platform that was first released in 2019 by the Chaos Engineering Working Group of the Cloud Native Computing Foundation (CNCF). The platform is designed to help users test the resiliency and reliability of their systems by injecting various types of failures and disruptions.

Chaos Mesh is built on top of Kubernetes and leverages its powerful orchestration capabilities to manage and control chaos experiments. It provides a user-friendly web UI and CLI tools that allow users to configure and run chaos experiments easily. Additionally, Chaos Mesh supports a wide range of failure scenarios, including pod failures, network failures, and resource exhaustion, among others.

One of the key features of Chaos Mesh is its ability to provide detailed observability and monitoring of chaos experiments. It generates detailed logs and metrics that allow users to analyze the behavior of their systems during chaos experiments and assess the impact of failures on their applications.

Chaos Mesh also provides several advanced features, such as scheduling and fault injection policies, that allow users to fine-tune their chaos experiments and control the impact of failures on their systems. Additionally, Chaos Mesh is highly scalable and can be easily deployed in large-scale environments.

Since its initial release, Chaos Mesh has gained significant popularity and has been adopted by several organizations to improve the resiliency and reliability of their systems. It has also received contributions from a vibrant community of developers and has been integrated with several other popular cloud-native tools and platforms.

Reference

Official Site of Chaos Mesh - <https://chaos-mesh.org/>

Chaos Mesh Github - <https://github.com/chaos-mesh/chaos-mesh>

Blog of Chaos Mesh - <https://chaos-mesh.org/blog/>

Chaos Mesh Slack - <http://slack.cncf.io>