



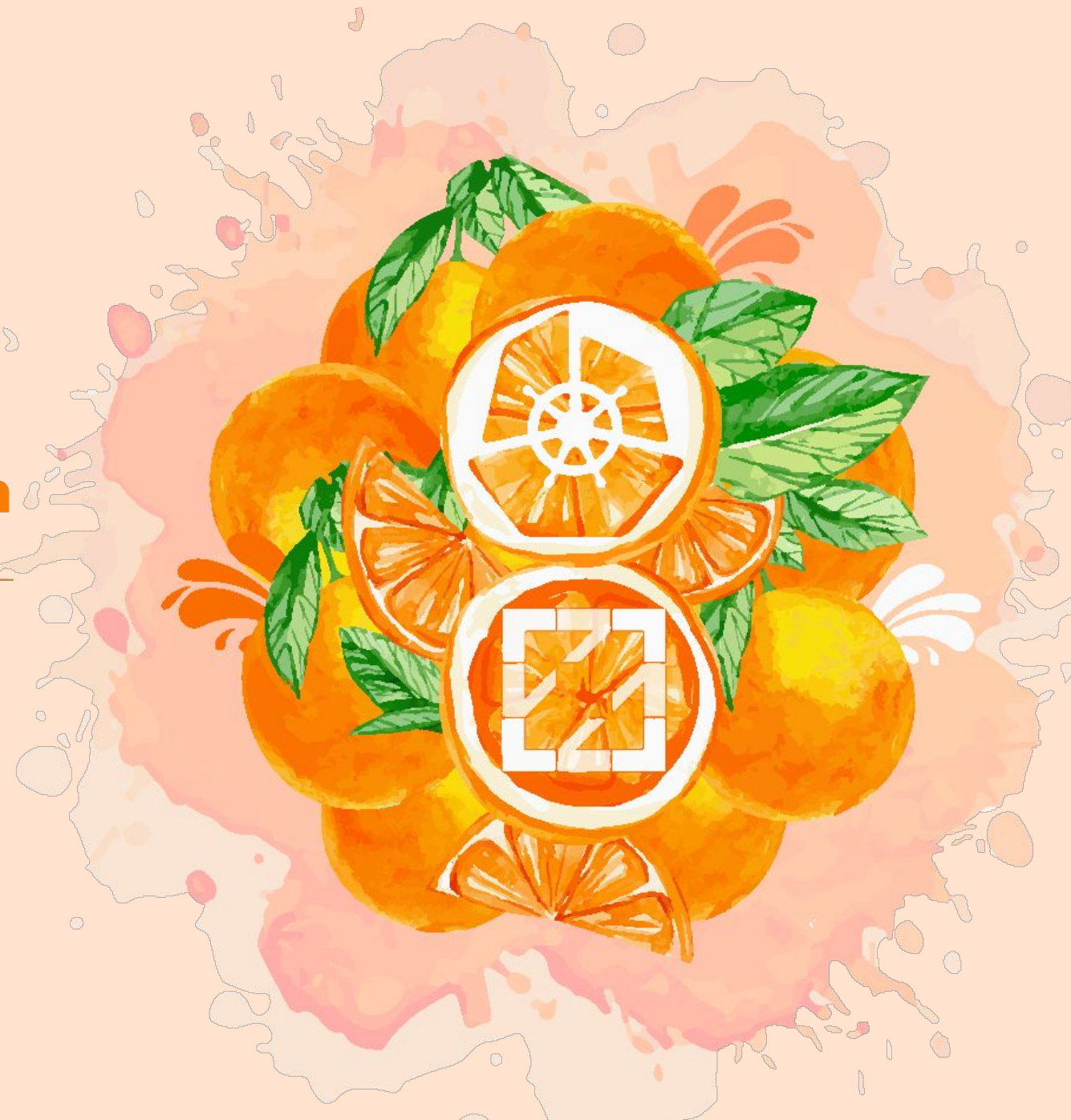
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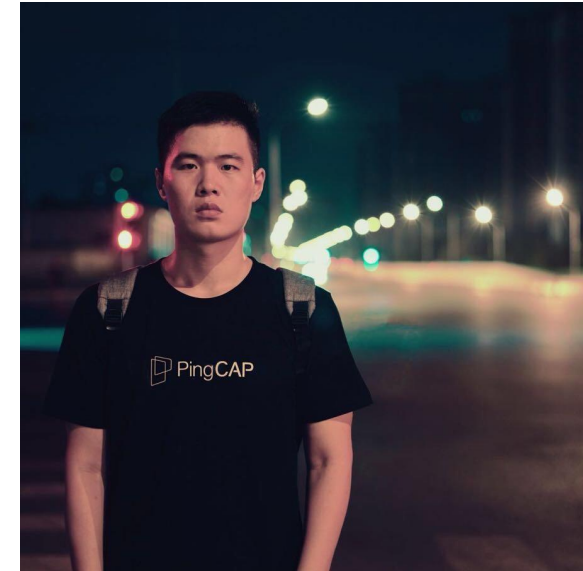
Make Cloud Chaos Engineering Easier - Deep Dive into Chaos Mesh

Cwen Yin
PingCAP



About Me

- Cwen(Chengwen) Yin
- Tech lead at PingCAP
- Maintainer and founder of Chaos Mesh



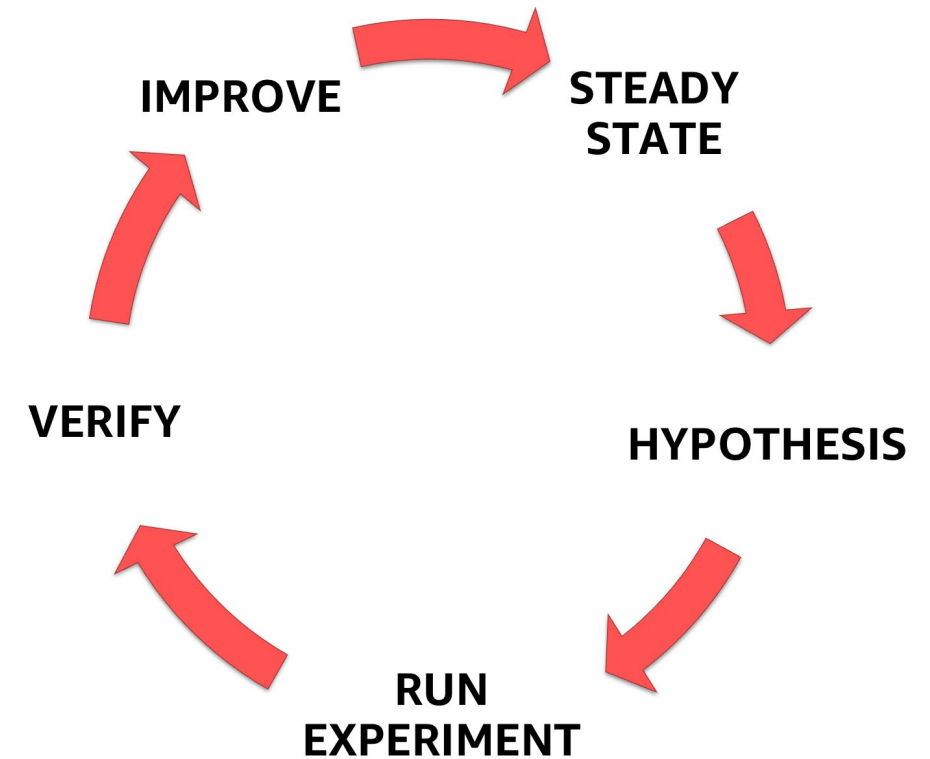
Testing a distributed system is difficult

- Distributed systems are more and more complex nowadays
 - Faults can happen anytime, anywhere, in any ways
- Writing tests and debugging is hard
 - Deterministic test is very hard and impossible to cover all faults

- No crash!!!
- No data loss!!!
- No wrong results!!!

Chaos Engineering to the rescue

- Chaos engineering is about breaking things in a **controlled environment** and through **well-planned experiments** in order to **build confidence** in your application to withstand turbulent conditions.
- Chaos engineering is **NOT** about breaking things randomly **without a purpose**.



Why Chaos Mesh



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```
$ kubectl get ns
tidb-cluster-1
tidb-cluster-2
tidb-cluster-3
nginx-ns-1
nginx-ns-2
app-ns-1
app-ns-2
...
$crontab -l
0 */2 * * * /usr/local/podkill -n tidb-cluster-1 -n tikv-1
0 */1 * * * /usr/local/podkill -n tidb-cluster-1 -n pd-1
0 */2 * * * /usr/local/network delay -v 20ms -n app-ns-1 -n
app-name
0 */2 * * * /usr/local/network delay -v 20ms -n app-ns-2 -n
app-name
...
```

On Kubernetes

- More application clusters (40+)
- More nodes on each cluster
- More target objects may fail, eg: Container / Pod / Network / Disk / System Clock / Kernel / etc

We need more Chaos experiments. However, **managing and scheduling many chaos experiments is a huge pain !**

In Docker

- The environment is different from the physical nodes
- Tools like tc / iptables / fuse / bcc can't be used directly
- Containers on the same node cannot affect each other

Chaos scope must be customizable and manageable for containers.



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What is Chaos Mesh

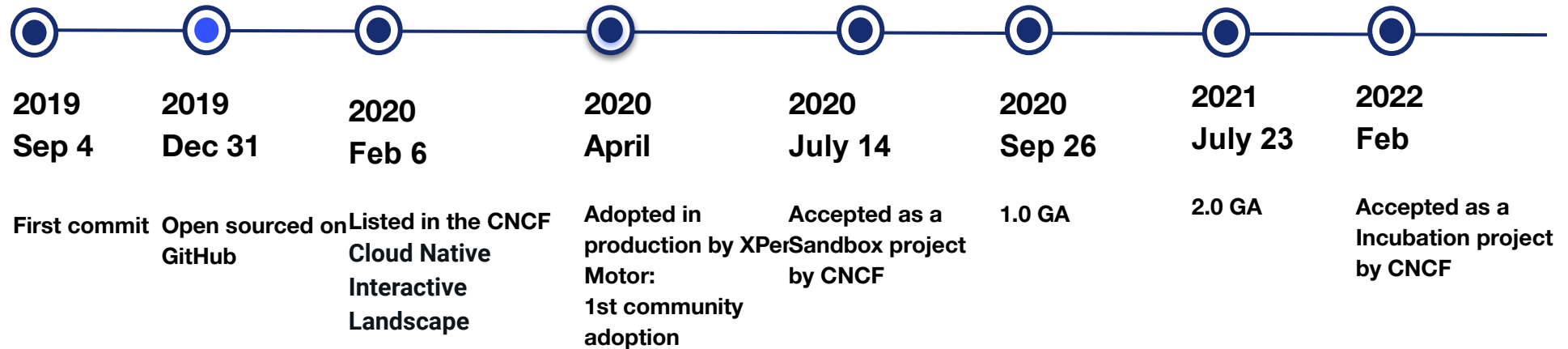


What is Chaos Mesh

- A Cloud-Native Chaos Engineering platform on Kubernetes environments
- Started out as the internal platform to test TiDB
- Provides fault injection methods into the container, Pod, network, system I/O, kernel, etc.

Chaos Mesh's Mission

- Make Chaos Engineering easy





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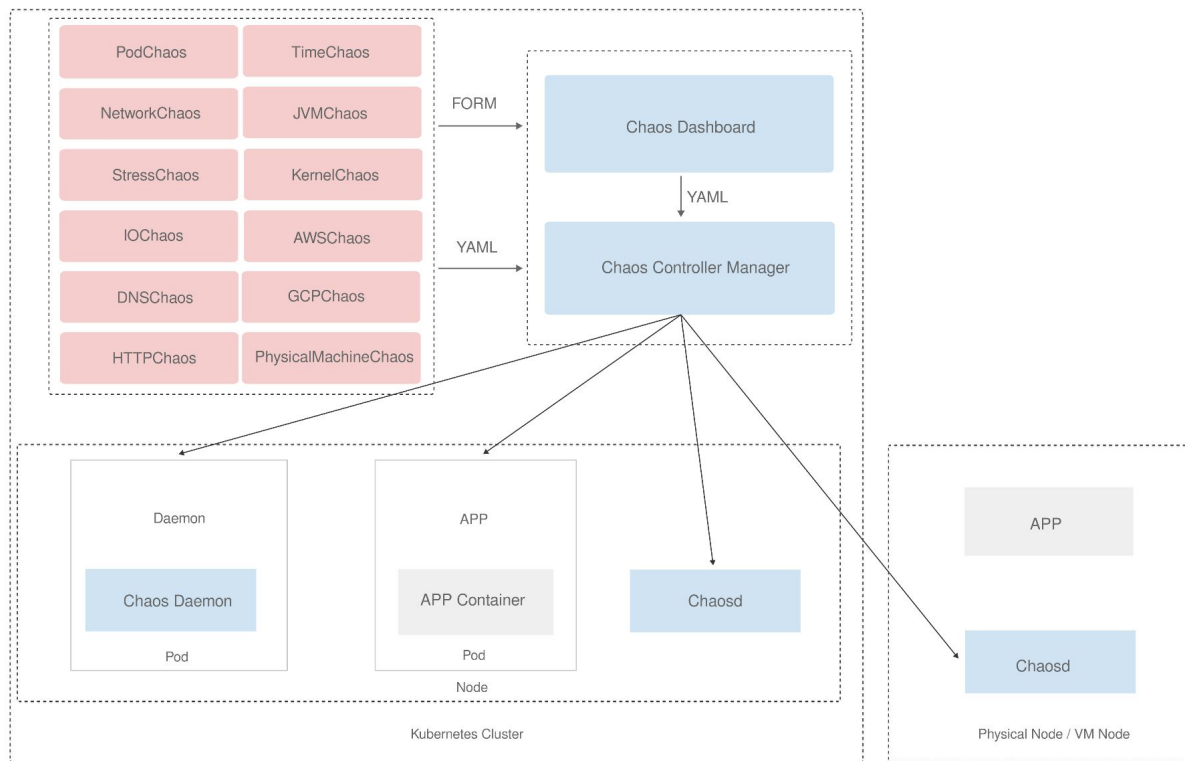
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Deep into Chaos Mesh

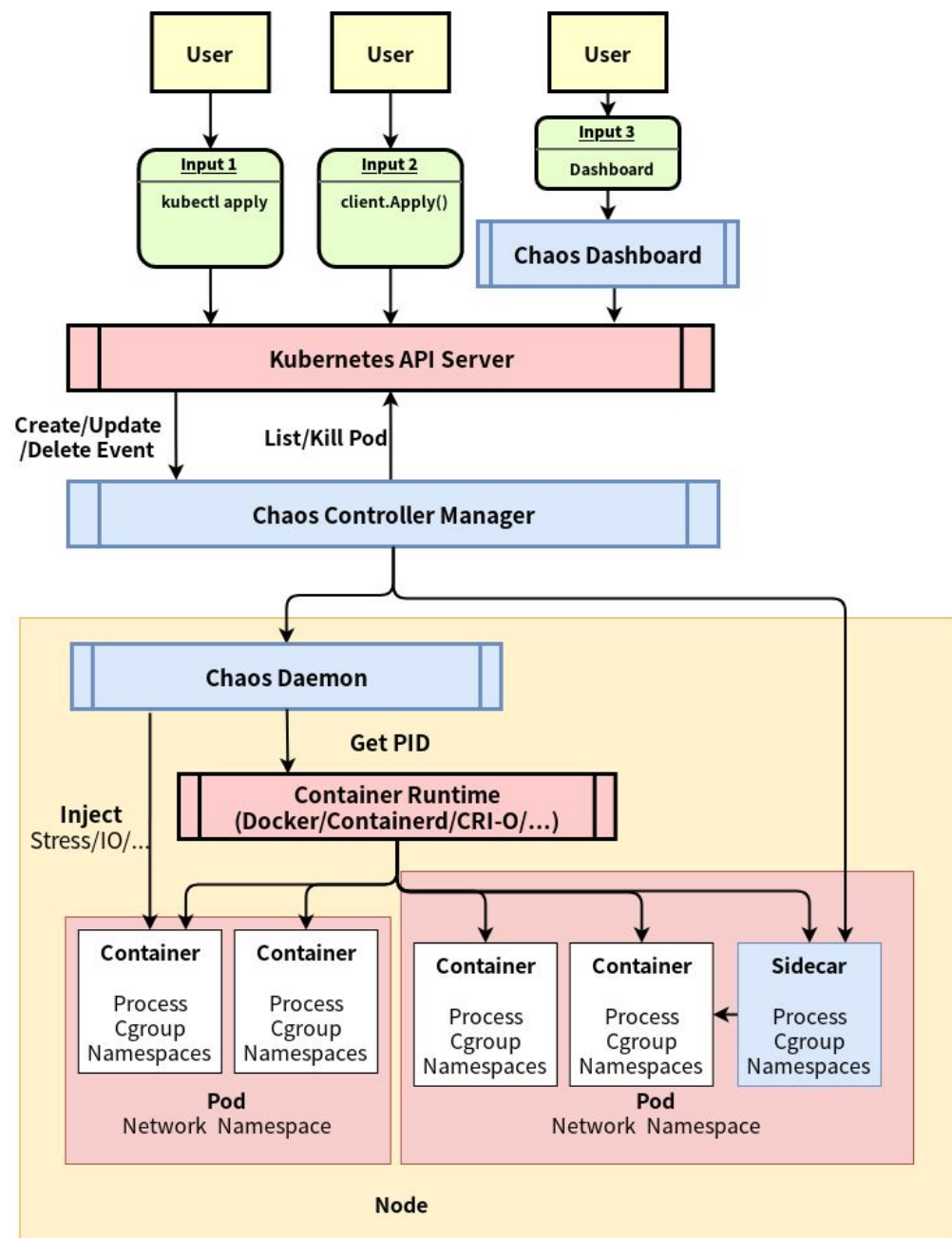


Architecture



- Chaos Dashboard
 - Manage and monitor chaos experiment
- Chaos Controller Manager
 - Schedule and control component
 - Workflow engine
- Chaos Daemon
 - Executive component on kubernetes node
- Chaosd
 - Executive component on non-kubernetes node

Architecture



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CustomResourceDefinitions



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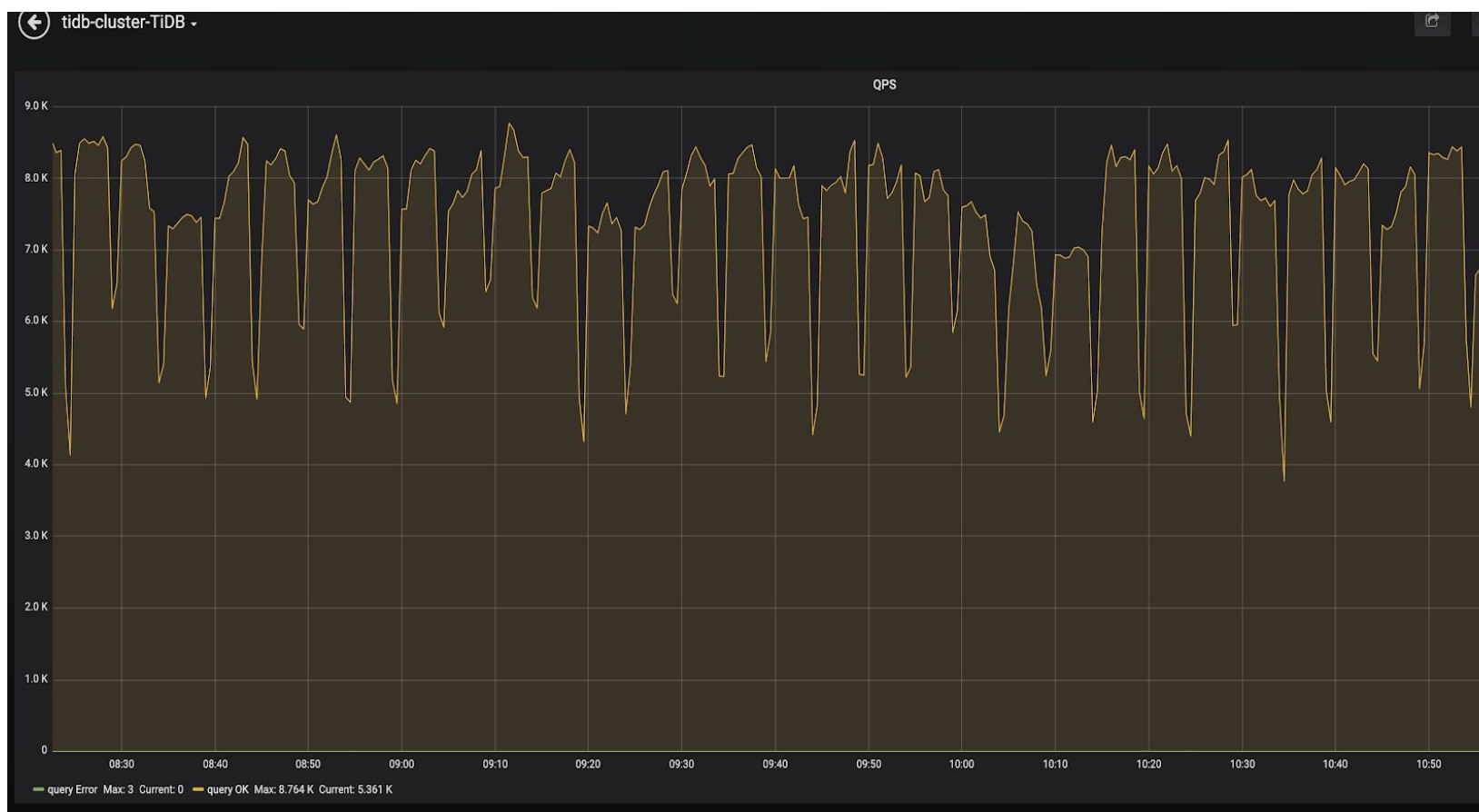
- PodChaos
- NetworkChaos
- IOChaos
- TimeChaos
- StressChaos
- KernelChaos
- JVMChaos
- DNSChaos
- Workflow
- PhysicalMachineChaos
- ...

```
apiVersion: chaos-mesh.org/v1alpha1
kind: PodChaos
metadata:
  name: pod-kill-example
spec:
  action: pod-kill
  mode: one
  selector:
    labelSelectors:
      "app.kubernetes.io/component": "tikv"
```

```
apiVersion: chaos-mesh.org/v1alpha1
kind: Schedule
metadata:
  name: schedule-pod-kill-example
spec:
  schedule: "@every 5m"
  type: "PodChaos"
  historyLimit: 5
  concurrencyPolicy: Forbid
  podChaos:
    action: "pod-kill"
    mode: one
    selector:
      labelSelectors:
        "app.kubernetes.io/component": "tikv"
```

Effects: pod kill

Kill a random pod every 5 minutes (sysbench - Point Select)



Workflow Engine



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- Three parts of the a workflow
 - Workflow Name
 - Entry, the entry of the whole workflow
 - Template array
- Five different types of templates
 - Serial
 - Parallel
 - Chaos
 - Suspend
 - Task
- Serial, Parallel, Task allow other nodes to be referenced as child nodes

```
apiVersion: chaos-mesh.org/v1alpha1
kind: Workflow
metadata:
  name: <name-of-workflow>
spec:
  entry: <refs-to-name-of-one-template>
  templates:
    - name: <name>
      templateType: <type>
    - name: <name>
      templateType: <type>
    ...
```

Workflow :

- name
- entry

template 1

template 2

template 3

entry can refer to
any template

Selectors

- Namespace selectors
- Label selectors
- Expression selectors
- Annotation selectors
- Field selectors
- PodPhase selectors
- Node selectors
- Node list
- Pod list

```
selector:  
  labelSelectors:  
    'app.kubernetes.io/component': 'tikv'
```



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Fill the experiment info

Scope

Namespace Selectors

Support mutiple options

Label Selectors

Support mutiple options

ADVANCED OPTIONS

Annotation Selectors

Support mutiple options

Mode

Random One

Select the experiment mode

Phase Selectors

all

Support mutiple options

Target Pods Preview

Checking or unchecking Pods to further limit the scope

No pods found

Basic

Name

The experiment name

ADVANCED OPTIONS

Run

Run continuously

Duration

The supported formats of the duration are: ms / s / m / h.

SUBMIT

Authorization

- Authorization mechanism based on Kubernetes RBAC permission policies.

Enter the token (RBAC Authorization) to continue

Don't know how to get the token? [Click here to generate](#)

Name

Please fill the token name

Token

Please fill the secret token

↑ SUBMIT

Token generator

🔧 Generate different tokens by choosing different namespaces and roles.

☐ Cluster scoped

Namespace

default

Choose namespace

Role

Viewer

Choose role

1. After choosing, save below content as rbac.yaml.

```
kind: ServiceAccount
apiVersion: v1
metadata:
  namespace: default
  name: account-default-viewer-qybbp

---
kind: Role
apiVersion: rbac.authorization.k8s.io/v1
metadata:
  namespace: default
  name: role-default-viewer-qybbp
```

COPY

2. Then run the following command:



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Demo





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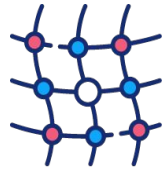
What is Next?



Future plans

- Ease of use
 - More comprehensive status inspection mechanism and reports
 - Improve Observability via event logs and metrics
- Security
 - A new component to force recovery chaos experiments, and avoid experiments going out of control
- Support running chaos experiment on multiple kubernetes clusters
- Provide a plugin approach to extend complex chaos types, such as RabbitMQChaos, RedisChaos, ...
- Build a hub for users sharing their own chaos workflow and chaos types
- Provide more tutorials & plugins to make integrating with ecological tools easier

Follow & communicate with us



chaos-mesh.org



CNCF - #project-chaos-mesh



github.com/chaos-mesh



@chaos_mesh



Channel: Chaos Mesh



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Thanks!!

