



**KubeCon**



**CloudNativeCon**

THE LINUX FOUNDATION



**AI\_dev**  
Open Source GenAI & ML Summit

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**China 2024**

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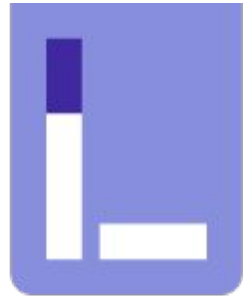
CloudNativeCon



China 2024

# What if Your System Experiences an Outage?

Let's Build a Resilient Systems with Chaos Engineering



# Litmus

Maintainer @LitmusChaos  
(CNCF incubating)



CNCF Ambassador

@namkyu1999 

@namkyu1999 

# Agenda: What is this talk about



China 2024

- **Programming distributed applications is challenging**
- **The average cost of downtime**
- **Impact of outage**
- **What is Chaos Engineering**
- **LitmusChaos**
- **Talk is cheap. Show me the code. (demo)**



# Programming distributed applications is challenging



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**Andy Stanley** ✓

@AndyStanley

If you don't know why it's working when it's working, you won't know how to fix it when it breaks.

3:25 AM · May 23, 2019

**179** Reposts   **11** Quotes   **750** Likes   **8** Bookmarks

<https://x.com/AndyStanley/status/1131264931297419264>

# Programming distributed applications is challenging



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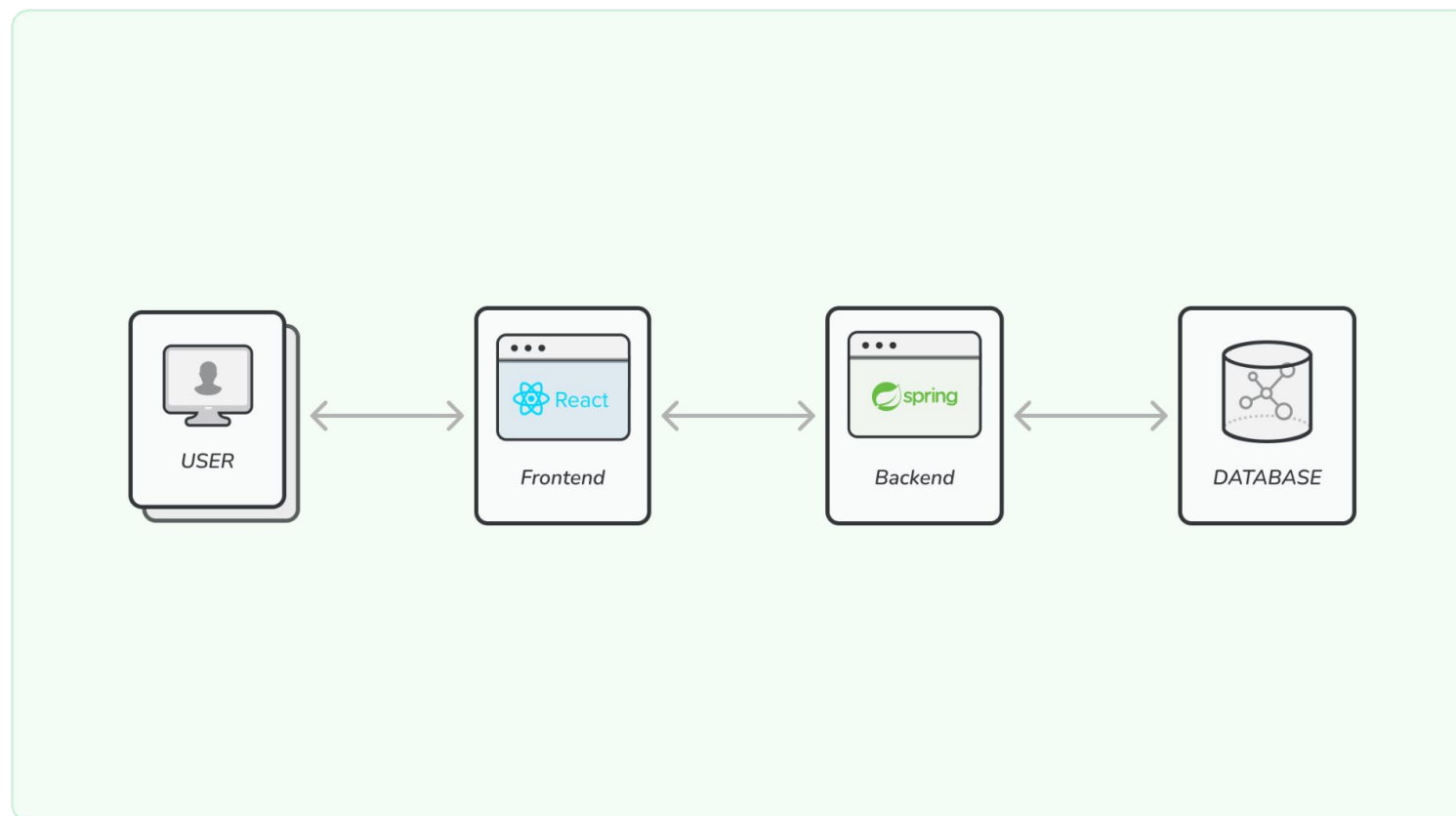
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A long time ago...

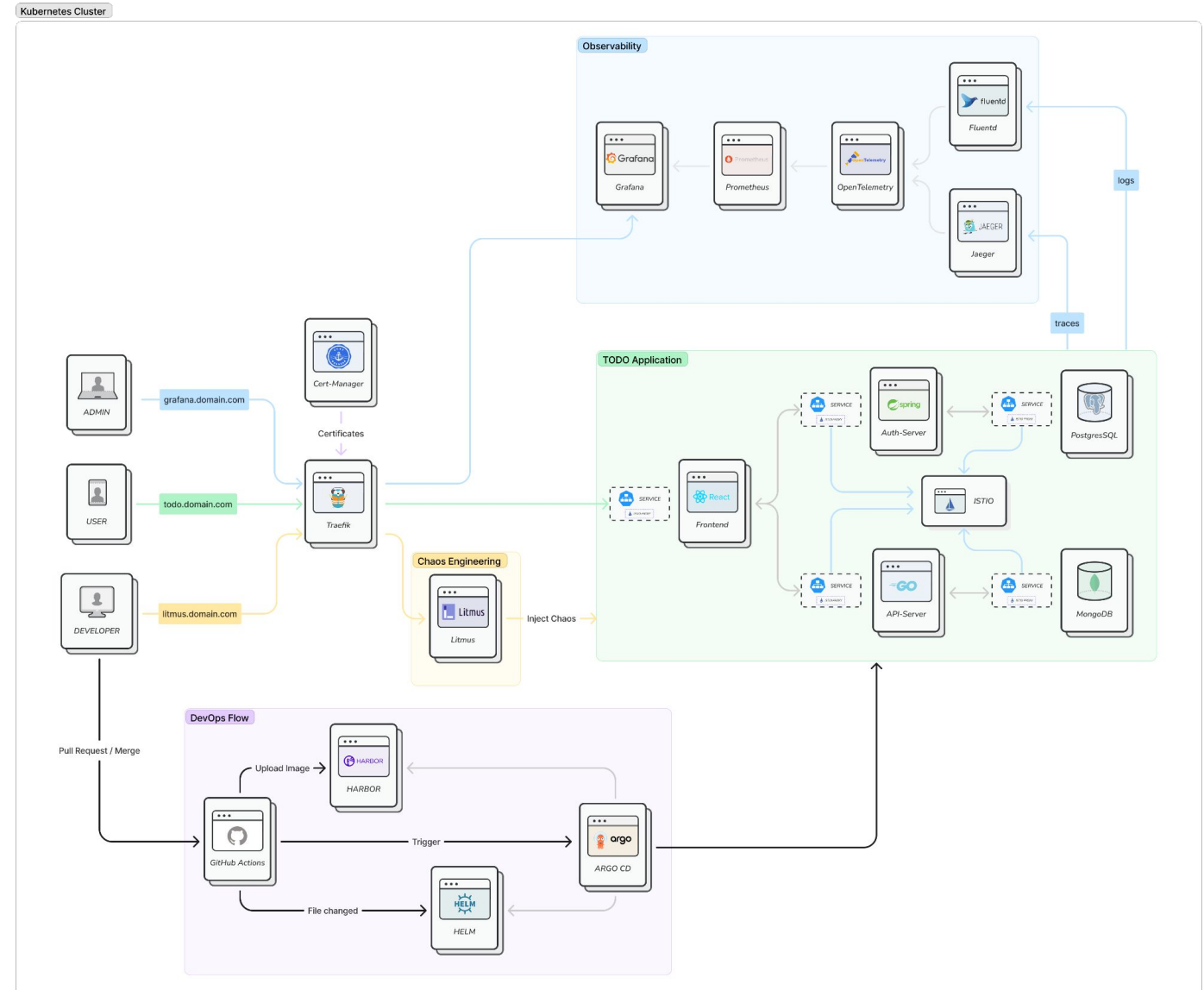


# Programming distributed applications is challenging



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Cloud native era..

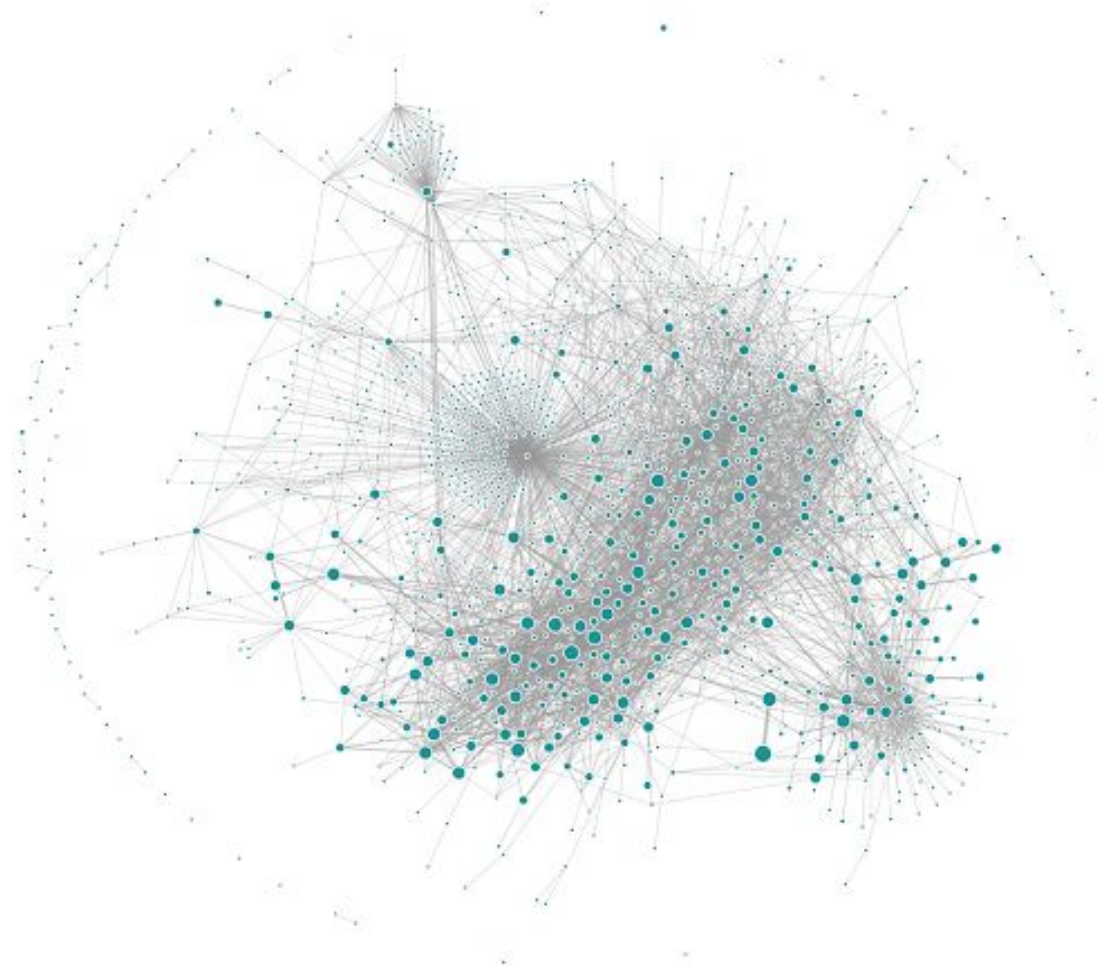


# Programming distributed applications is challenging



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Nowadays...



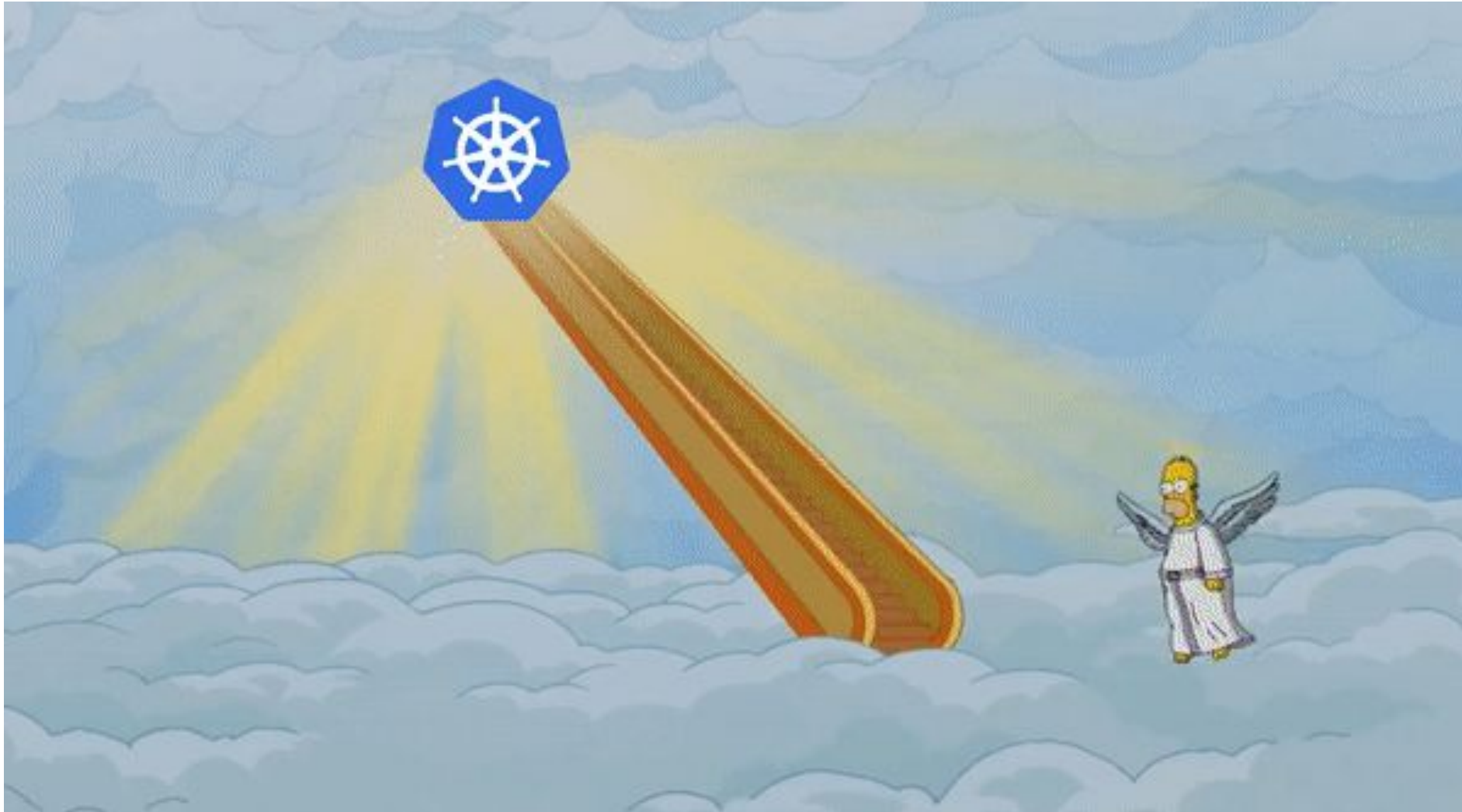
<https://www.uber.com/en-KR/blog/microservice-architecture/>



# Programming distributed applications is challenging



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<https://x.com/memenetes/status/1637861860039876624>

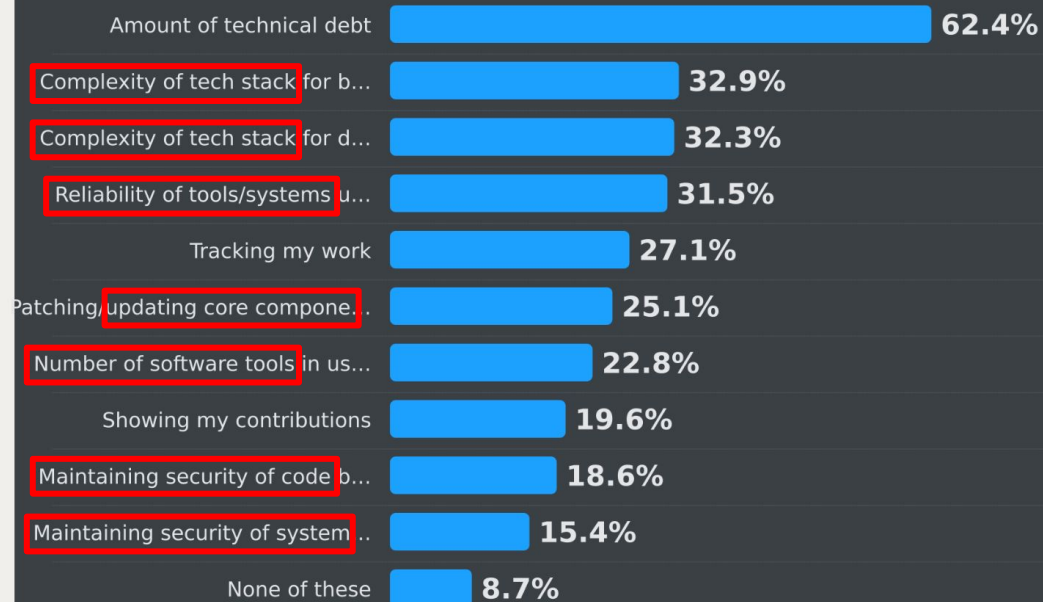
# Programming distributed applications is challenging



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Developer Experience / All Respondents

## Most common frustrations



Source: [survey.stackoverflow.co/2024](https://survey.stackoverflow.co/2024)  
Data licensed under Open Database License (ODbL)

<https://survey.stackoverflow.co/2024/professional-developers#developer-experience-frustration>

# The average cost of downtime



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**\$25k/h**

Small business

**\$540k/h**

large business

**\$1 million/h**

Fortune 1000 companies

# Impact of outage



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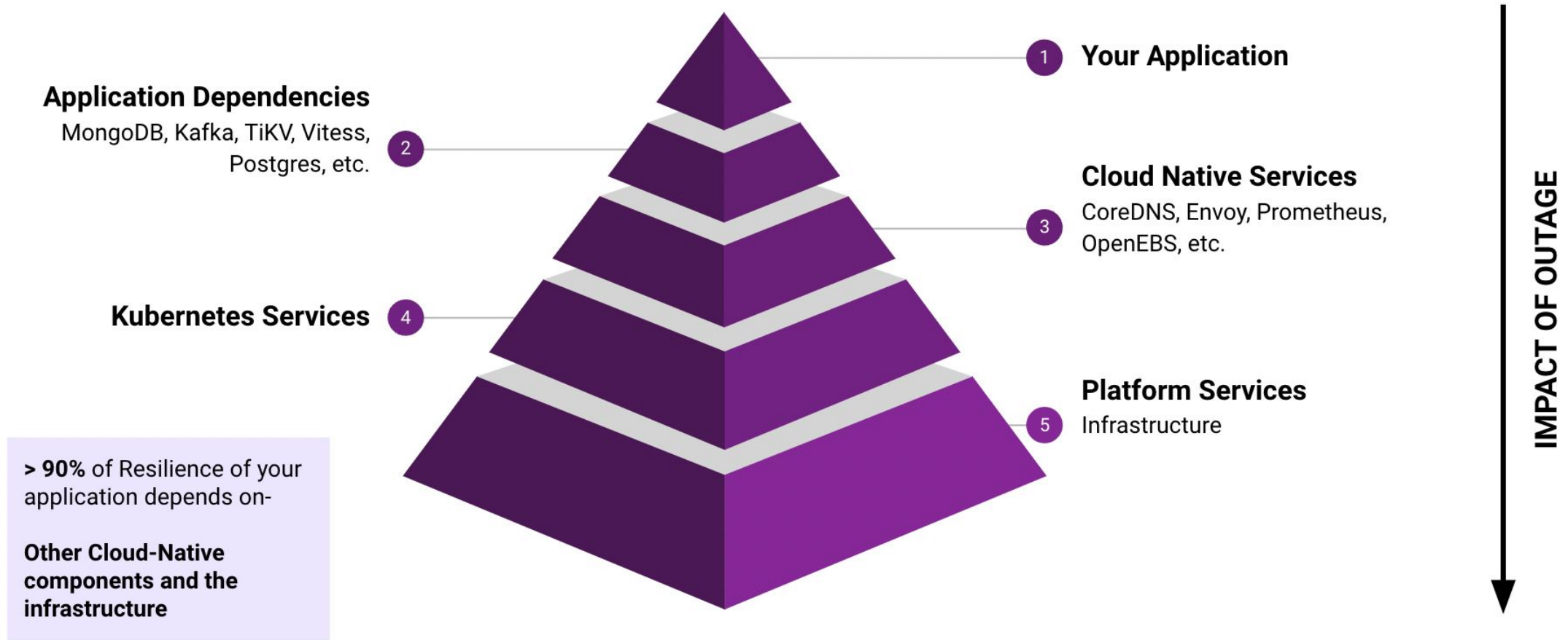
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# Here comes chaos engineering!



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We need to identify **weaknesses** before they manifest in system-wide, aberrant behaviors.



# What is Chaos Engineering



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**“Chaos Engineering** is the discipline of experimenting on a system in order to build confidence in the system’s capability to withstand turbulent conditions in production.”

—Principles of Chaos Engineering

<https://principlesofchaos.org/>

# What is Chaos Engineering



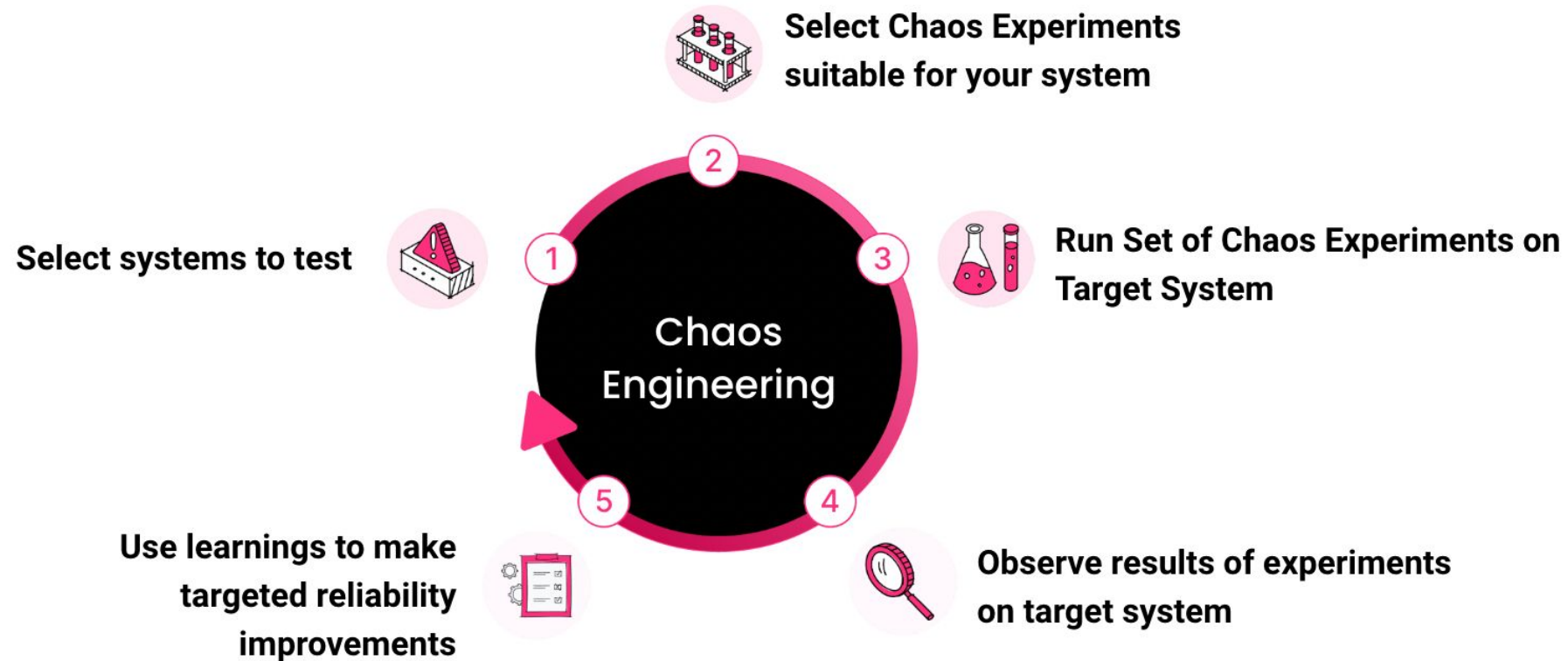
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Chaos Engineering enables teams to identify weaknesses & potential outages in infrastructures by inducing chaos tests in a **controlled way**.

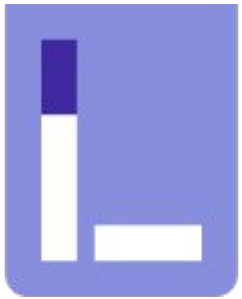
# What is Chaos Engineering



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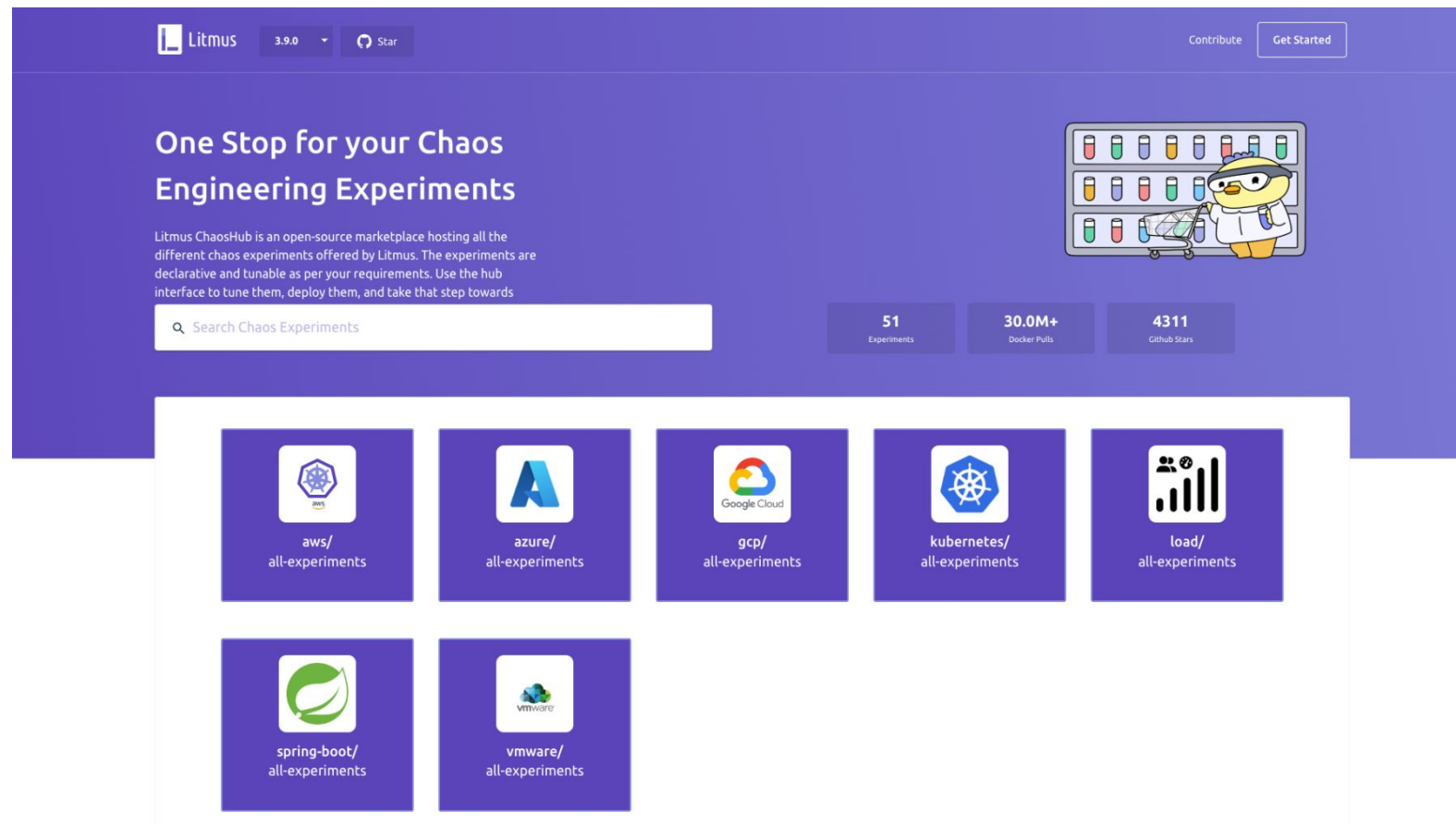
<https://docs.litmuschaos.io/docs/introduction/usage>



# Litmus

**LitmusChaos** is an Open Source Cloud-Native Chaos Engineering Framework with cross-cloud support. It is a CNCF incubating project with adoption across several organizations

Litmus has 50+ experiments, supports Kubernetes, Cloud Vendor(AWS, GCP, Azure) and Application(Spring, k6) chaos!





# Talk is cheap. Show me the code.



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## GitHub Repo



# Key Open Sources used in Demo



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## Distributed Application Runtime



**Dapr** is a portable, event-driven runtime that makes it easy for any developer to build resilient, stateless and stateful applications that run on the cloud and edge and embraces the diversity of languages and developer frameworks.

## Load testing



**Grafana k6** is an open-source, developer-friendly, and extensible load testing tool. k6 allows you to prevent performance issues and proactively improve reliability.

# Key Open Sources used in Demo



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## Monitoring



**Prometheus** is an open-source systems monitoring and alerting toolkit. Prometheus collects and stores its metrics as time series data, i.e. metrics information is stored with the timestamp at which it was recorded, alongside optional key-value pairs called labels.

## Load testing



**Backstage** is an open source framework for building developer portals. Powered by a centralized software catalog, Backstage restores order to your microservices and infrastructure and enables your product teams to ship high-quality code quickly without compromising autonomy.

# Demo Scenario

A simple order and delivery app

- Using message queue
- Using dapr (easy to make microservice)



# Demo - Version 1



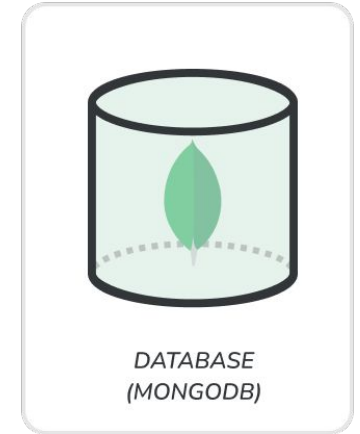
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```
{
  _id: ObjectId('66baf429344a55e434f0047f'),
  orderID: 'a8c456e1-26e4-465b-bd56-ce0636a8391e',
  isDelivered: false
}
```



Updated when delivery app received pub/sub messages

```
{
  _id: ObjectId('66baf429344a55e434f0047f'),
  orderID: 'a8c456e1-26e4-465b-bd56-ce0636a8391e',
  isDelivered: true
}
```



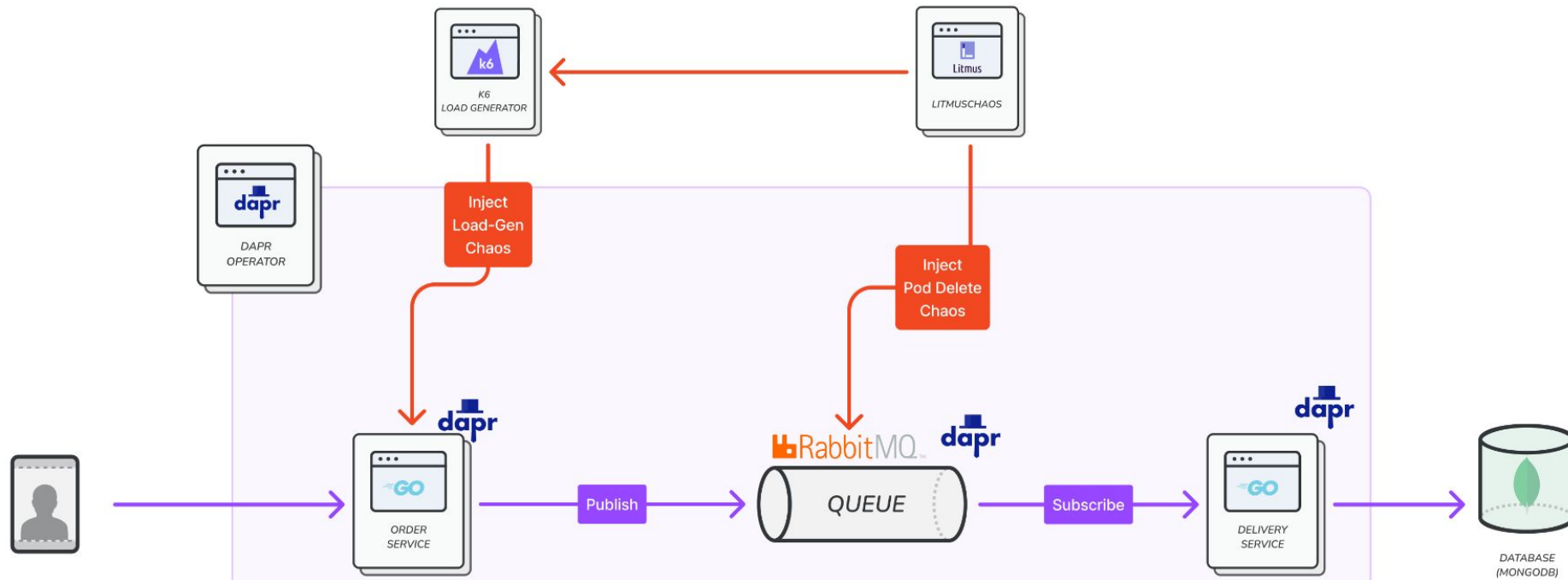


# Demo - Version 1



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v1



# Demo - Chaos Engineering Plan



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## Hypothesis

When sending **100 requests per second** to the order app, **all messages should be delivered** to the delivery app **without loss**, even if the message queue pod is randomly deleted.

# Demo - Chaos Engineering Plan



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## Hypothesis

Message queue pod delete

-> Should be re-created after one of the pods is deleted. (Use a http probe)

Load testing

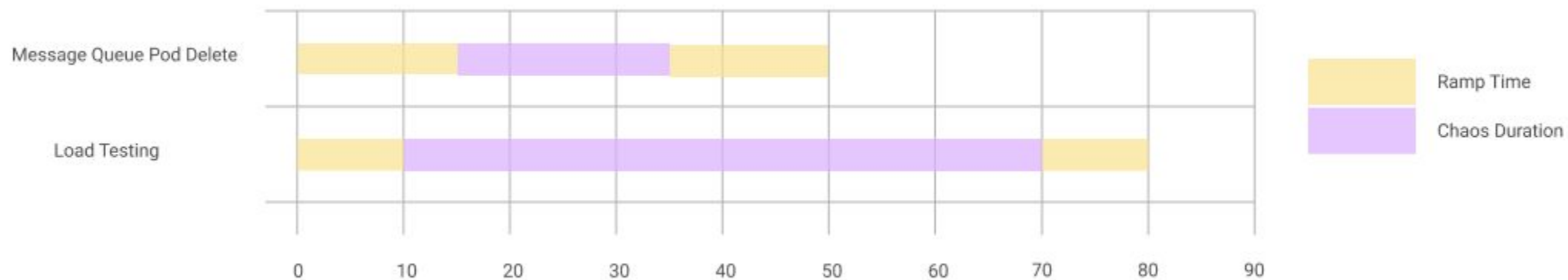
-> All data must have "isDelivered" set to true. (Use a cmd chaos)

# Demo - Chaos Engineering Plan



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## Testing plan



# Demo - Version 1



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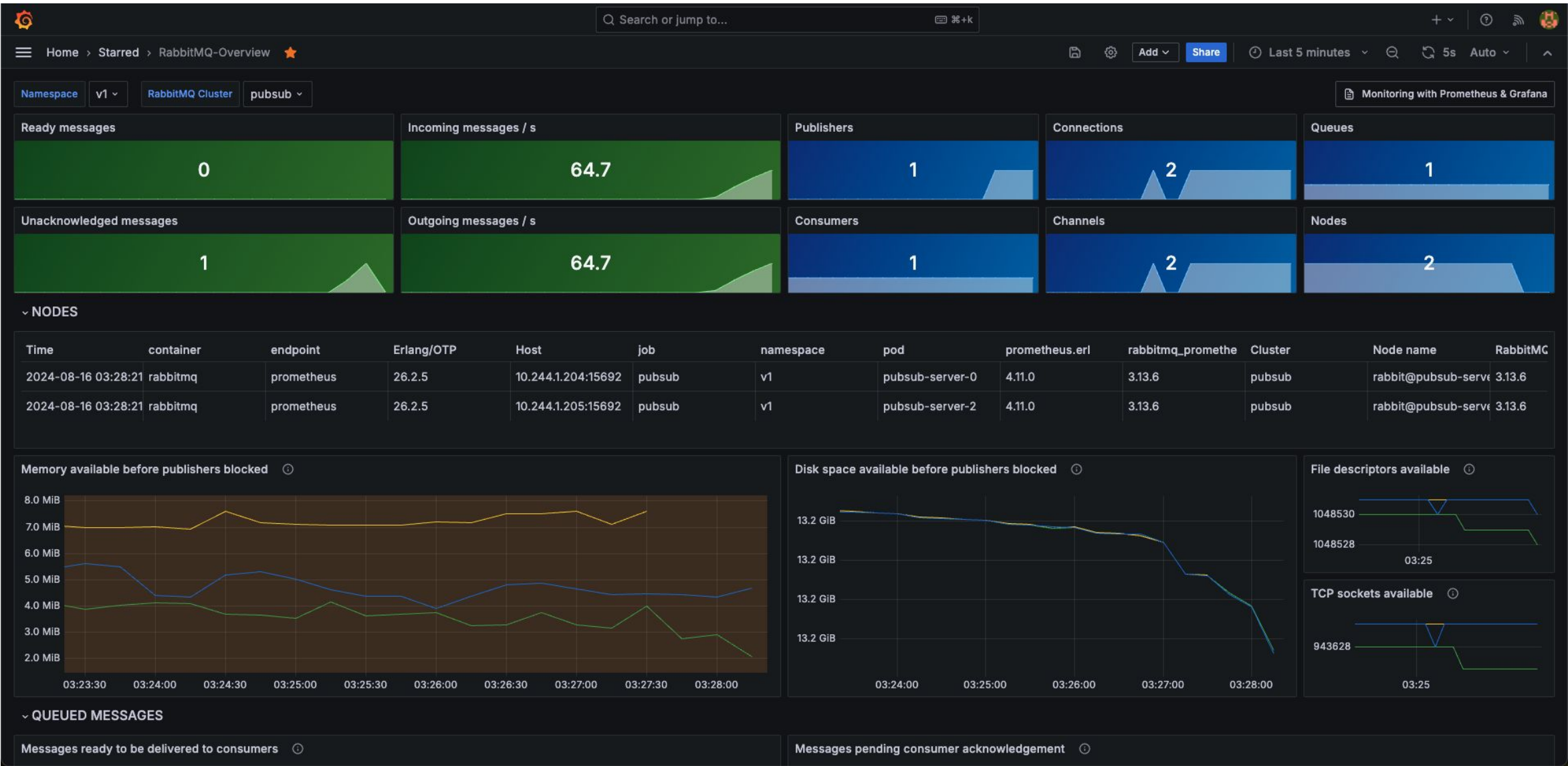
**Let's Chaos** 🔥 🔥



# Demo - Version 1



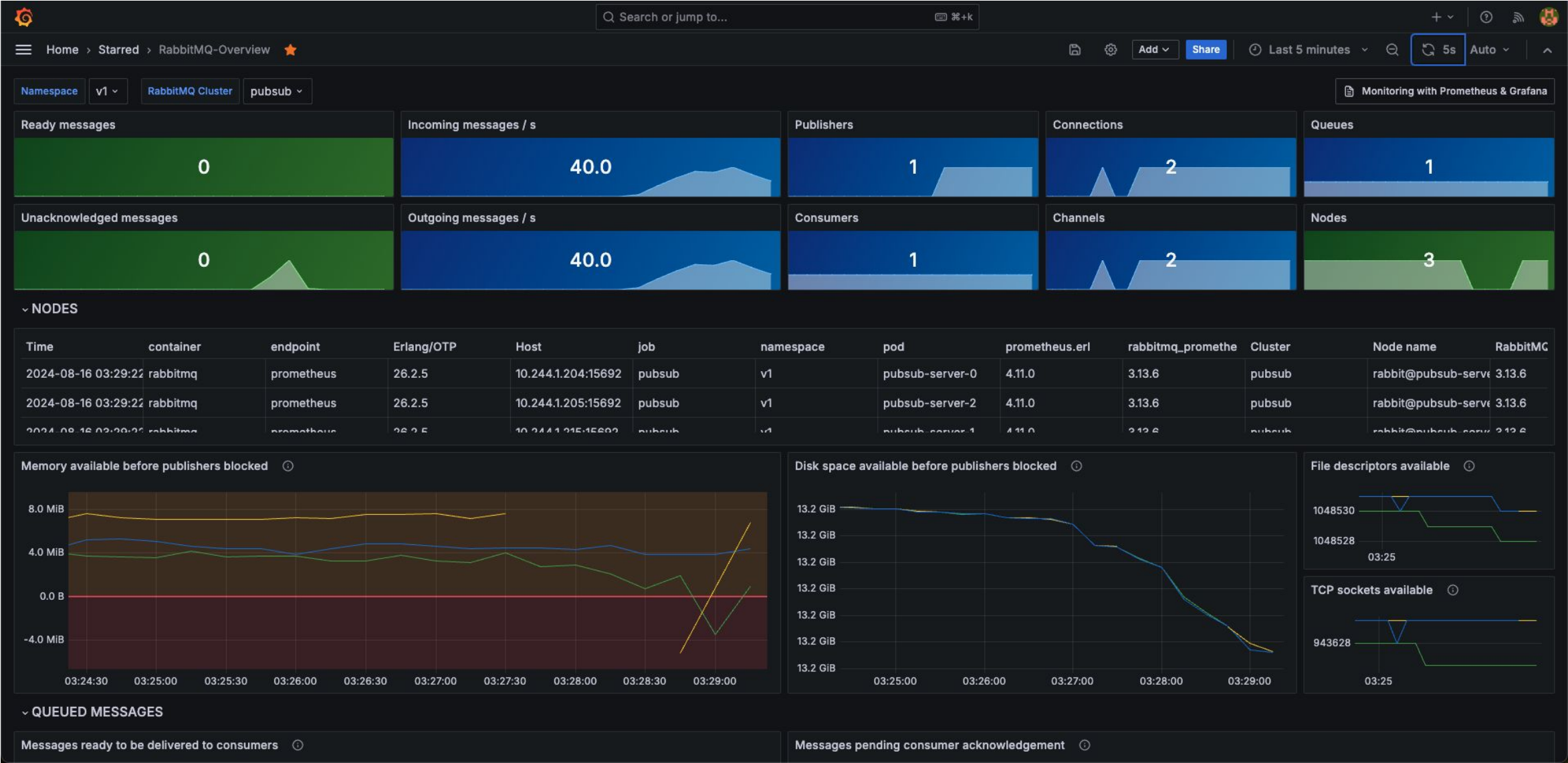
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# Demo - Version 1



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# Demo - Version 1



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Litmus

Project

admin-project >

Overview

Chaos Experiments

Environments

Resilience Probes

ChaosHubs

PROJECT SETUP

ADMIN

Litmus 3.0

My Project > Chaos Experiments > test1 >

test1

(Execution ID: 15)

COMPLETED

Hosted on Infrastructure: testt

Duration 16 Aug 2024, 03:26 - 03:30 3m 34s

Resilience Score

50%

Run

Edit

Clone

Download Manifest

Fault: k6-loadgen-63q COMPLETED

Probe Result (Total 1)

0 Passed 1 Failed

Duration: 16 Aug 2024, 03:26 - 03:29 3m 4s

Namespace: litmus

Probes

Logs

Fault Configuration

assert-v1

Type cmdProbe

Mode EOT

FAILED

Probe Summary

Actual value: 9. Expected value: should be equal to 0

View Probe Details

View Probe Properties

# Demo - Shift to Version 2



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## What's changed

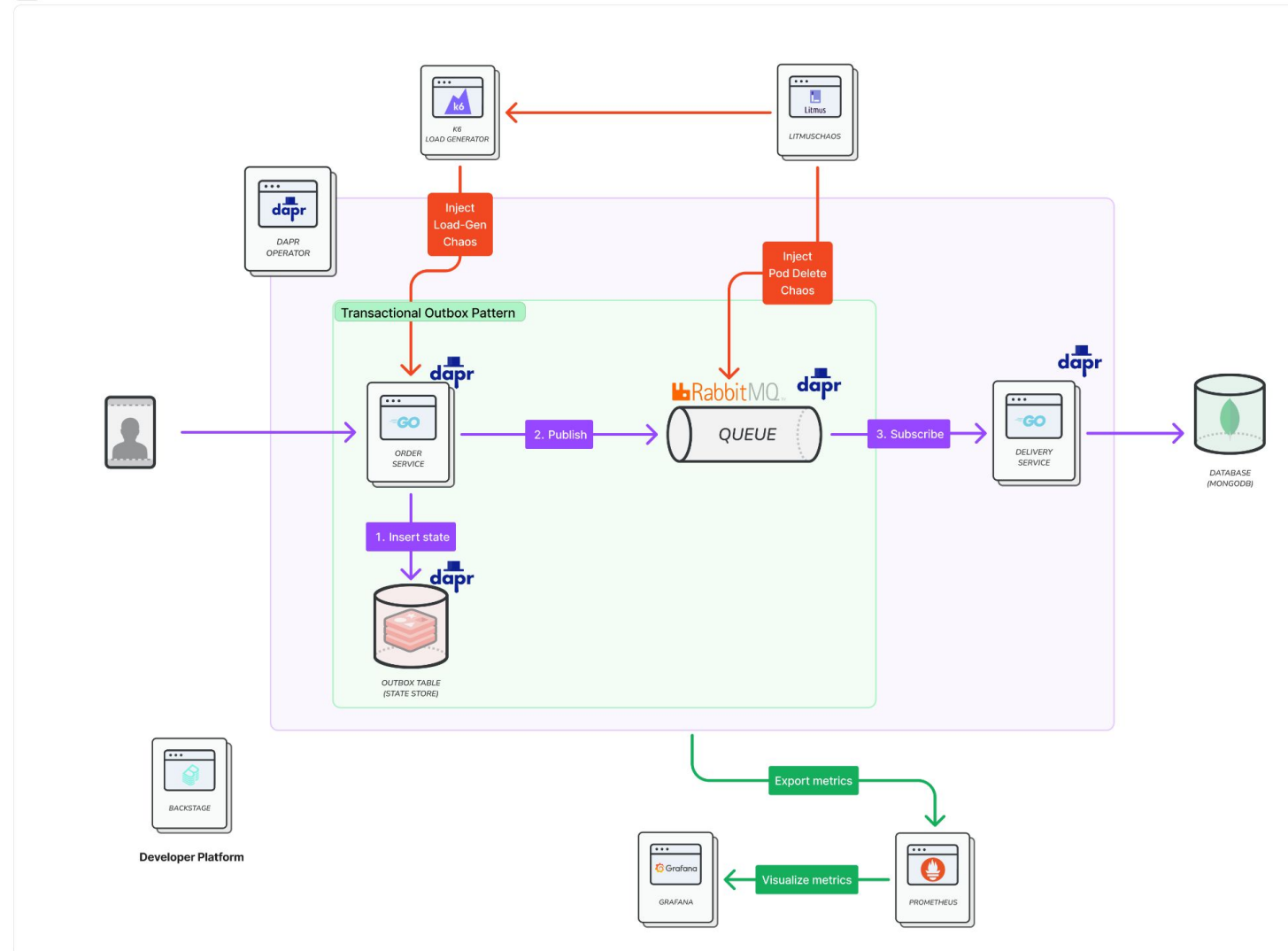
- Adopted transactional outbox pattern (Dapr supports!)
- Deployed RabbitMQ as a high availability mode (Queue Mirroring)

# Demo - Version 2



China 2024

v2





**Let's Chaos Again** 🔥 🔥



# Demo - Version 2



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Q Search or jump to...

☰ Home > Starred > RabbitMQ-Overview

📄 ⚙️ Add Share ⌚ Last 5 minutes 🔍 ↺ 5s Auto ⬆

Namespace v2 RabbitMQ Cluster pubsub

Refresh dashboard Monitoring with Prometheus & Grafana

Ready messages0

Unacknowledged messages92

Incoming messages / s104

Outgoing messages / s104

Publishers1

Consumers3

Connections2

Channels2

Queues3

Nodes2

Nodes

Time	container	endpoint	Erlang/OTP	Host	job	namespace	pod	prometheus.erl	rabbitmq_promethe	Cluster	Node name	RabbitMQ
2024-08-16 02:55:35	rabbitmq	prometheus	26.2.5	10.244.1.164:15692	pubsub	v2	pubsub-server-1	4.11.0	3.13.6	pubsub	rabbit@pubsub-serve	3.13.6
2024-08-16 02:55:35	rabbitmq	prometheus	26.2.5	10.244.1.94:15692	pubsub	v2	pubsub-server-0	4.11.0	3.13.6	pubsub	rabbit@pubsub-serve	3.13.6

Memory available before publishers blocked

Disk space available before publishers blocked

File descriptors available

TCP sockets available

Queued Messages

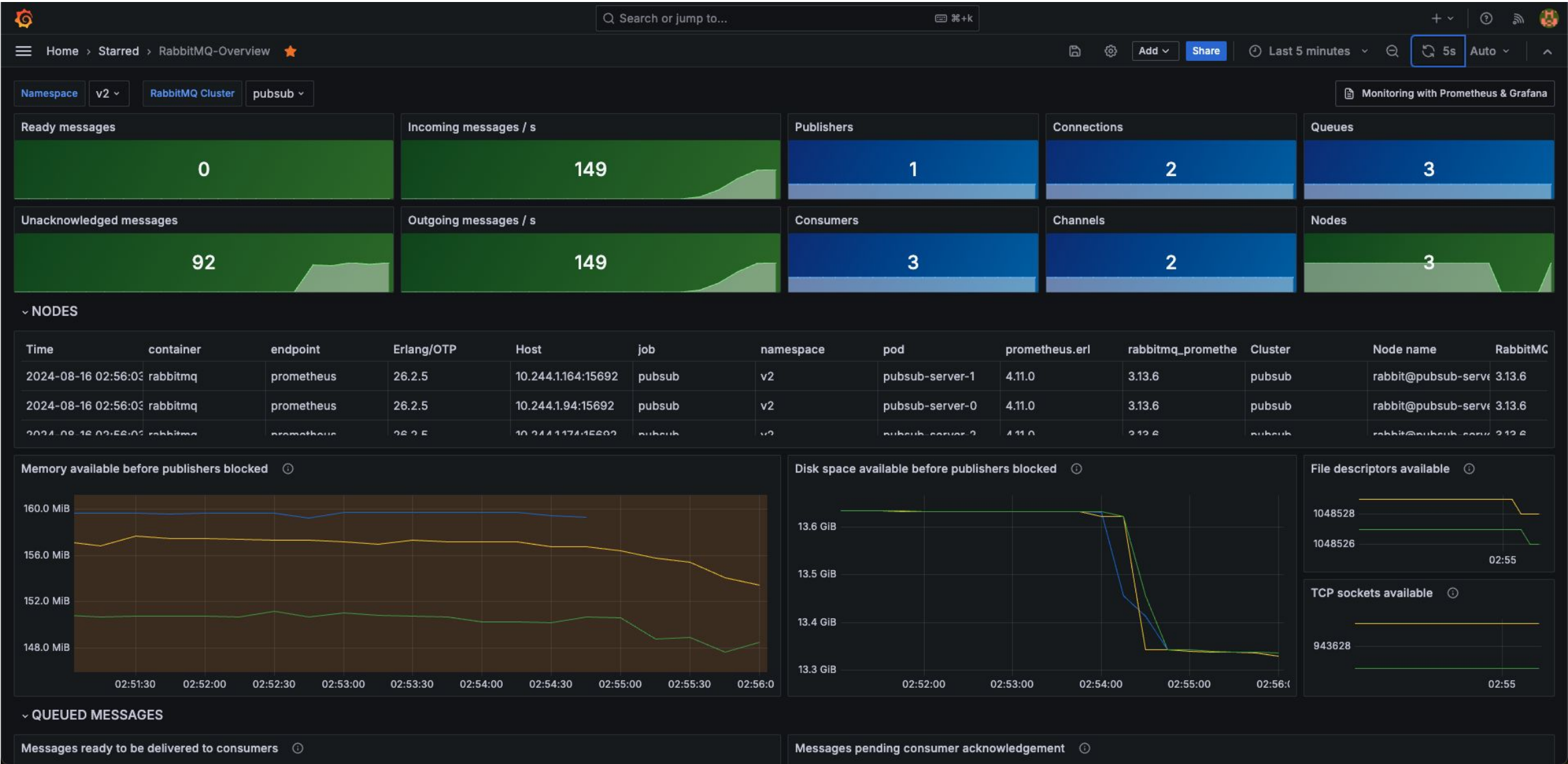
Messages ready to be delivered to consumers

Messages pending consumer acknowledgement

# Demo - Version 2



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# Demo - Version 2



China 2024

Litmus

Project

admin-project

Overview

Chaos Experiments

Environments

Resilience Probes

ChaosHubs

PROJECT SETUP

My Project > Chaos Experiments > test2 >

test2

(Execution ID: 18)

COMPLETED

Hosted on Infrastructure: testt

Duration 14 Aug 2024, 18:13 - 18:17

3m 43s

install-chaos-faults

k6-loadgen-o7f

cleanup-chaos-resources

pod-delete-ci9

Resilience Score

100%

Fault: k6-loadgen-o7f

COMPLETED

X

Probe Result (Total 1)

1 Passed

0 Failed

Duration:

14 Aug 2024, 18:13 - 18:16

3m 2s

Namespace:

litmus

Probes

Logs

Fault Configuration

assert-v2

Type cmdProbe

Mode EOT

PASSED

^

Probe Summary

Actual value: '0'. Expected value: '0'

View Probe Details

View Probe Properties

Litmus 3.0

ADMIN

# How about Backstage?



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**We can manage all of things at once with Backstage 🧐**



# How about Backstage?



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Backstage

Search

Home

APIs

Docs

Create...

Settings

About

<>

VIEW

TECHDOCS

VIEW

DESCRIPTION

No description

OWNER

guests

SYSTEM

examples

TYPE

website

LIFECYCLE

experimental

TAGS

No Tags

Litmus

EXPERIMENT RUNS

CHAOSHUBS

INFRAS

EXPERIMENTS

GITOPS

2

1

2

NO

Go to Dashboard →

Dashboards

TITLE	FOLDER
Dapr Sidecar Dashboard	dapr
Dapr System Services Dashboard	dapr
RabbitMQ-Overview	dapr

Home > D... > dapr > RabbitMQ-Overv...

Namespace

v2

RabbitMQ Cluster

pubsub

Monitoring with Prometheus & Grafana

Ready messages

0

Incoming message...

95.1

Publishers

1

Connecti...

2

Queues

4

Unacknowledged ...

100

Outgoing message...

95.1

Consumers

3

Channels

2

Nodes

3

# How about Backstage?



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Backstage

Search

Home

APIs

Docs

Create...

Settings

pubsub ☆

guests experimental

OVERVIEWLITMUSCI/CDDEPENDENCIESDOCS

Dev Info

Experiment Docs

Litmus API Docs

Litmus Docs

Litmus ChaosHub

Litmus Community

Chaos Hubs

NAME	EXPERIMENTS	FAULTS
● Litmus ChaosHub	10	51
● custom	10	51

Environments

NAME	TYPE	IS_REMOVED	INFRA
ttt	pre-prod	false	1

Experiments

NAME	NEXT RUN	RECENT EXPERIMENT RUNS	INFRA
test1	Non-Cron	●●●●●●●●	testt
test2	Non-Cron	●●●●●●●●	testt





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**Thank you!**