



CLOUD NATIVE  
COMPUTING FOUNDATION

# K8s 上的图数据库

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❏ [wey-gu](#)

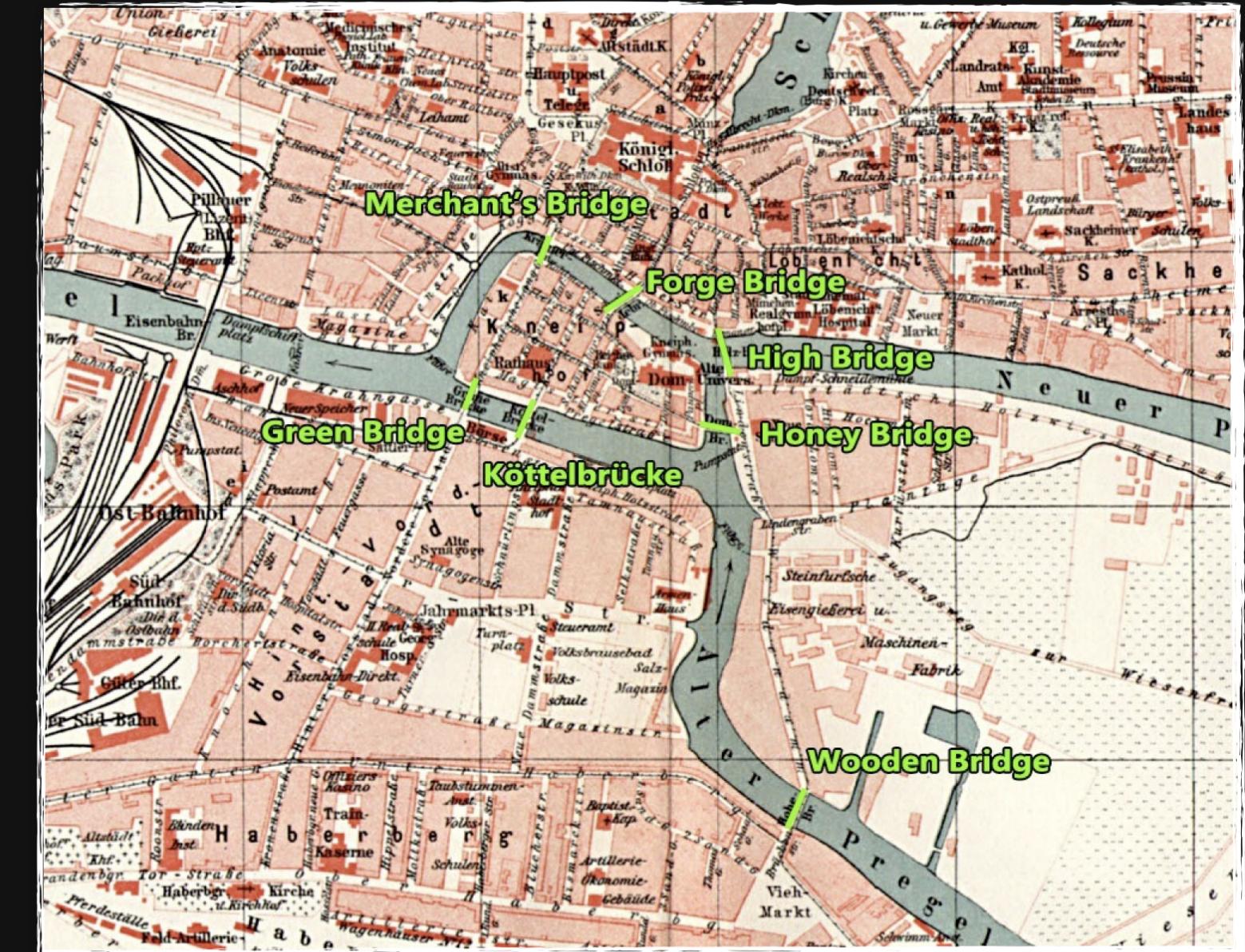
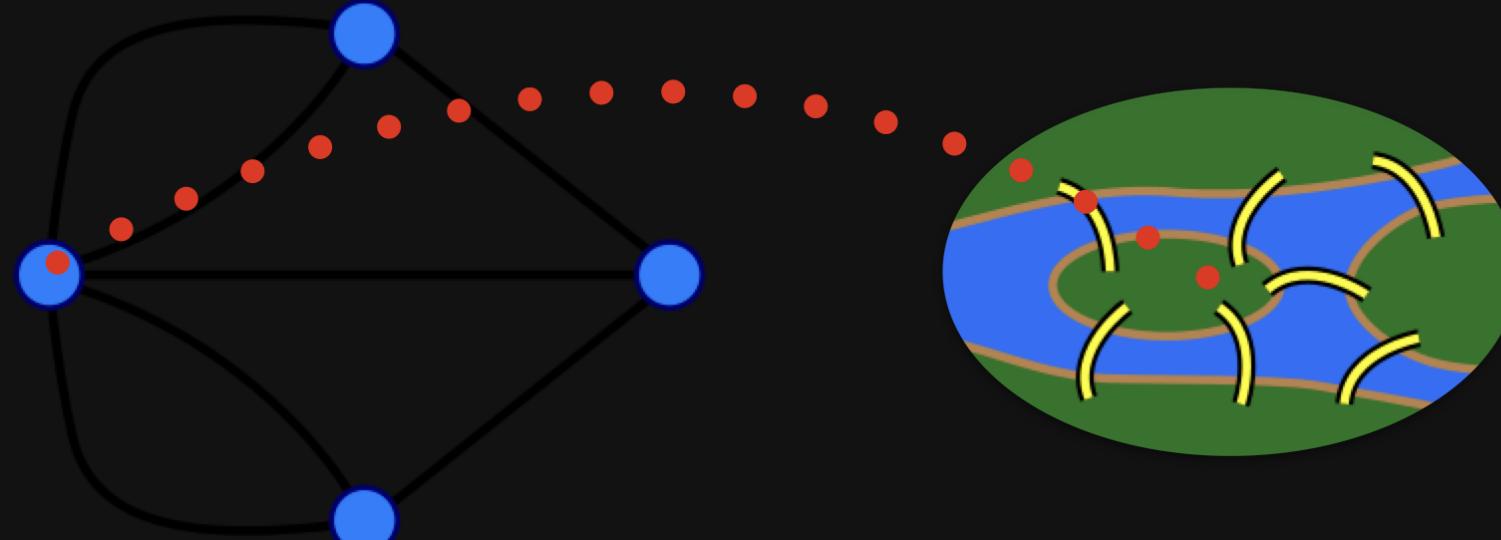
❏ [wey\\_gu](#)

❏ [siwei.io](#)

# 图数据库简介

什么是图? 什么是图数据库? 为什么我们需要一个专门的数据库?

# 什么是图？



Map of Königsberg with the seven bridges labeled, circa 1905



"以图结构、图语义来用点、边、属性来查询、表示存储数据的数据库

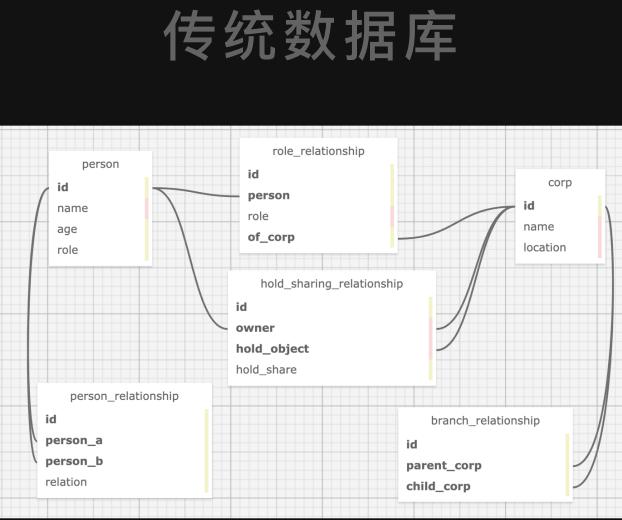
什么是图数据库

[wikipedia.org/wiki/graph\\_database](https://en.wikipedia.org/wiki/Graph_database)

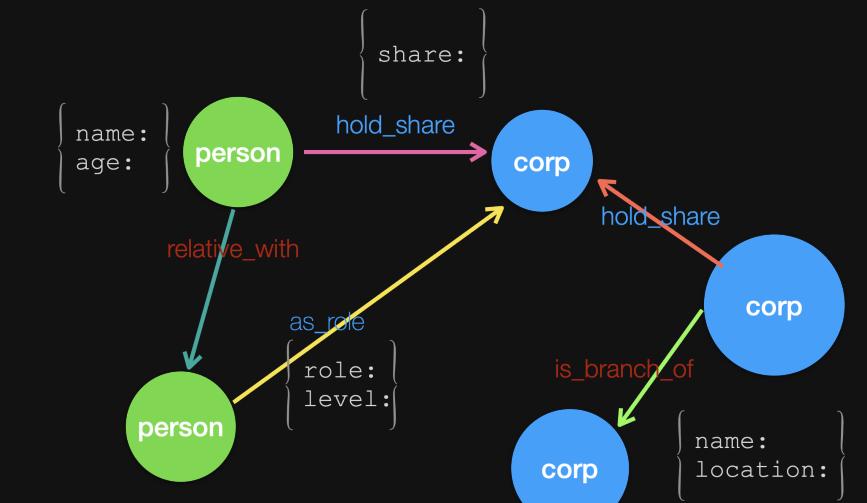
了解更多关于 [什么是图数据库](#)

# 为什么需要图数据库？

图模型的结构



图数据库



图语义的查询

```
SELECT a.id, a.name, c.name
FROM player a
JOIN serve b ON a.id=b.player_id
JOIN team c ON c.id=b.team_id
WHERE c.name IN (SELECT c.name
FROM player a
JOIN serve b ON a.id=b.player_id
JOIN team c ON c.id=b.team_id
WHERE a.name = 'Tim Duncan')
```

```
GO FROM 100 OVER serve YIELD serve._dst AS Team | \
GO FROM $-.Team OVER serve REVERSELY YIELD $$ .player.name;
```

性能

	主要应用场景	2-hop 延时 (~2.5K)	3-hop 延时 (~110K)	4-hop 延时 (~600K)
图数据库	关系遍历	0.01 秒	0.168 秒	1.36 秒
SQL数据库	信息检索	0.016 秒	30 秒	1544 秒

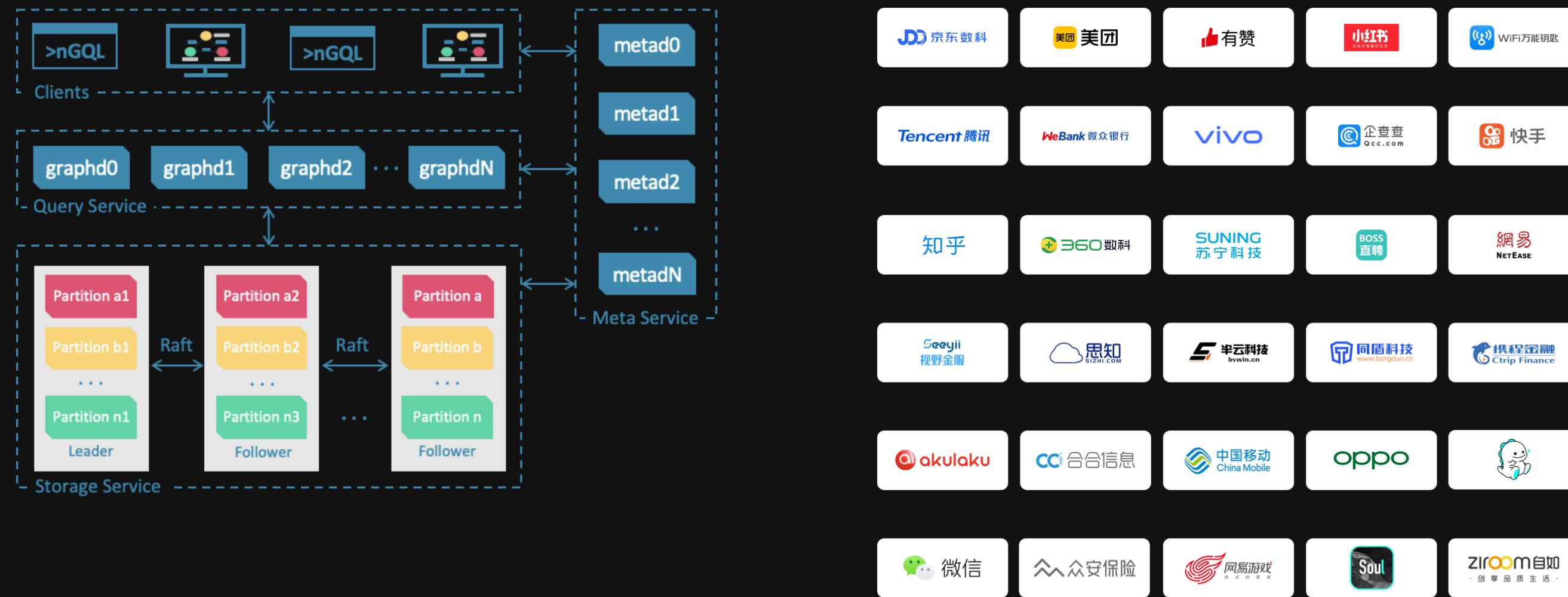
# Nebula Graph!

如何发音：['nebjələ]，它有哪些特点？

# Nebula Graph 介绍

一个可靠的分布式、线性扩容、性能高效的图数据库

世界上唯一能够容纳千亿顶点和万亿条边，并提供毫秒级查询延时的图数据库解决方案



了解更多 >>>

文档: Nebula 架构

官网: 用户案例

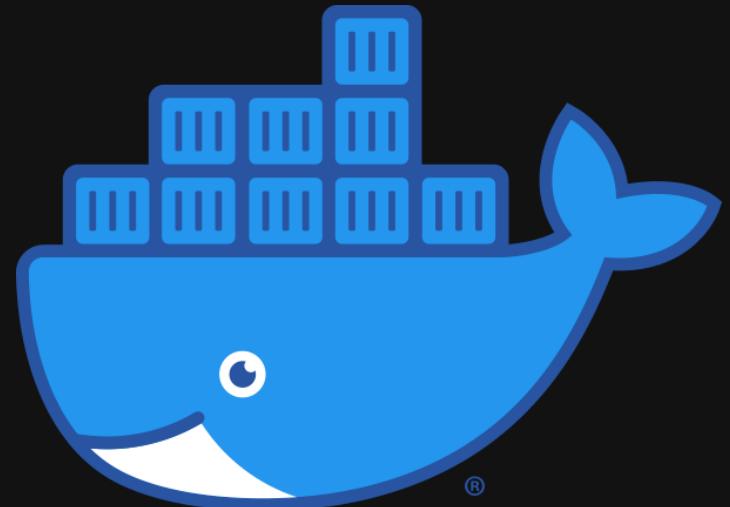




# 云原生时代的图数据库

# 容器化部署演进

NEBULA DOCKER



NEBULA K8S



NEBULA OPERATOR



# Nebula Operator 实现

## KUBEBUILDER SCAFFOLD

```
.  
├── apis  
..  
|   └── apps  
|   └── cmd  
|       └── ngctl  
|       └── controller-manager  
|   └── config  
|       └── crd  
└── pkg  
    ├── controller  
    ├── ngctl  
    ├── nebula  
    └── scheduler  
└── hack  
└── doc  
└── tests  
    └── e2e
```

## CRD

```
apiVersion: apps.nebula-graph.io/v1alpha1  
kind: NebulaCluster  
metadata:  
  name: nebula  
spec:  
  graphd:  
    resources:  
      requests:  
        cpu: "500m"  
        memory: "500Mi"  
    replicas: 3  
    image: vesoft/nebula-graphd  
    version: v2.5.0  
...  
  reference:  
    name: statefulsets.apps.kruise.io  
    version: v1  
  schedulerName: default-scheduler
```

## CONTROL LOOP

```
while True  
    actual_state = get_state(context)  
    expected_state = get_expected(context)  
    if actual_state == expected_state:  
        continue  
    else:  
        reconcile(context)
```

## CALLING NEBULA CLUSTER

```
func (s *storUpd) updPhase(mc nebula.MI) {  
    if err := mc.Balance(); err != nil {  
        return err  
    }  
    hostItem, err := mc.ListHosts()  
    if err != nil {  
        return err  
    }  
    if !mc.IsBalanced(hostItem) {  
        if err := mc.Balance(); err != nil {  
            return err  
        }
```

# Nebula Operator Roadmap

- Rolling Upgrade
- Auto Scaling
- Integration with other Services

Check out our Github Repo and contribute!  
[vesoft-inc/nebula-operator](https://github.com/vesoft-inc/nebula-operator)

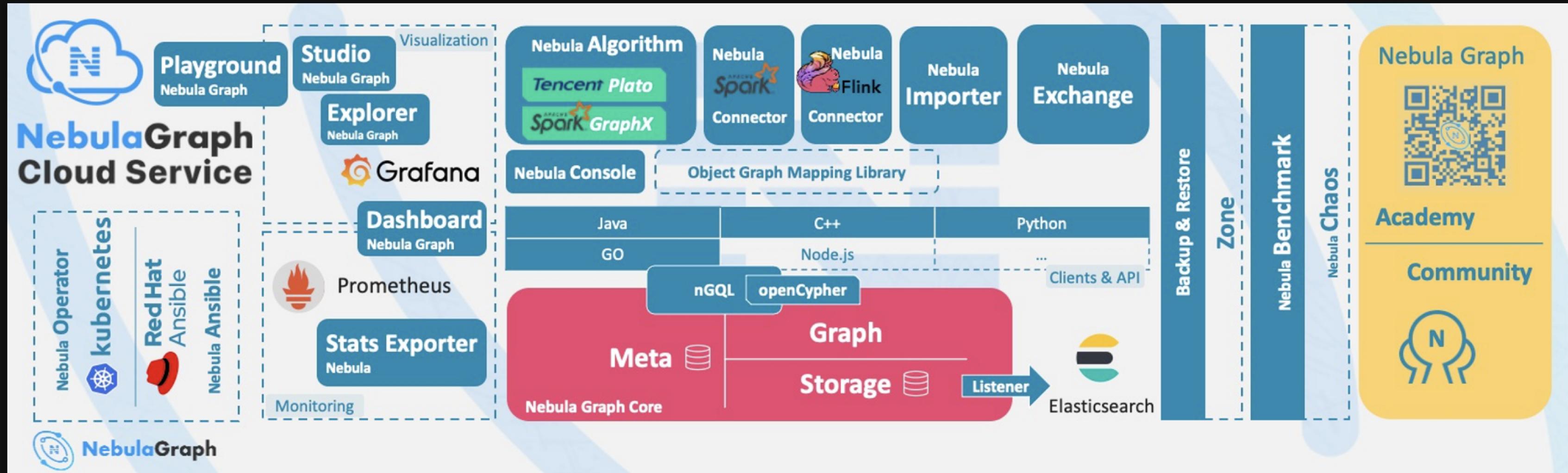
roadmap of **nebula-operator**



# Nebula Landscape

Nebula 社区生态非常丰富，并且还在日益拓展，欢迎同学们了解、参与贡献。

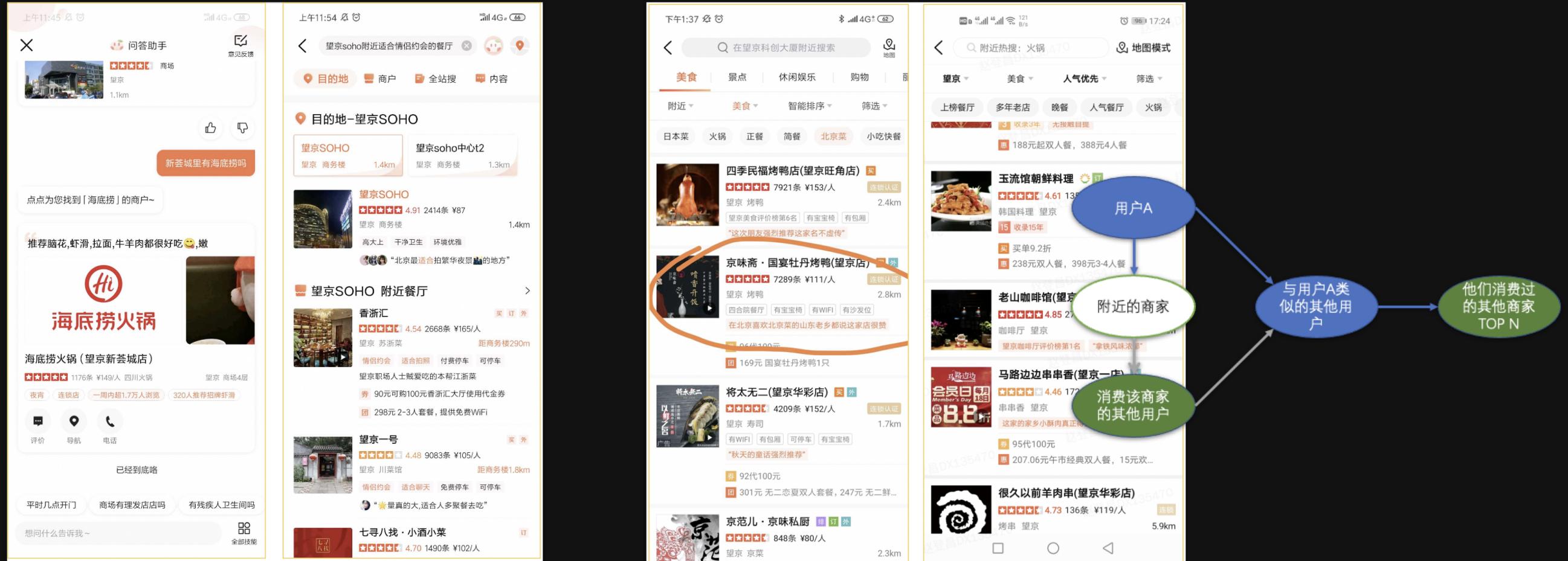
- Deployment, Monitoring
- Data Visualization
- Algorithm, Analytic
- Clients, Connectors, ETL



# 上手 GraphDB on K8s

应用场景 - Nebula on Kubesphere - Demo

# 图数据库的应用场景



## 典型场景

社交网络

风险控制

公共安全

知识图谱

机器学习

生化制药

物联网

区块链

数据血缘

智能运维

# KubeSphere + OpenFunction

```
kk create cluster --with-kubernetes v1.20.4 --with-kubesphere v3.1.1
git clone https://github.com/OpenFunction/OpenFunction.git
cd OpenFunction
sh hack/deploy.sh --all
kubectl apply -f https://raw.githubusercontent.com/OpenFunction/OpenFunction/main/config/bundle.yaml
kubectl create secret docker-registry push-secret \
  --docker-server=$REGISTRY_SERVER \
  --docker-username=$REGISTRY_USER \
  --docker-password=$REGISTRY_PASSWORD
kubectl --namespace kourier-system edit service kourier # externalIP
vim config/samples/function-sample.yaml # container image registry
kubectl apply -f config/samples/function-sample.yaml
$ kubectl get function
NAMESPACE      NAME          BUILDSTATE    SERVINGSTATE   BUILDER           SERVING
default        function-sample Succeeded     Created        function-sample-builder-s2pfg function-sample-serving-9sszk
$ kubectl get ksvc
NAME                           URL
function-sample-serving-9sszk-ksvc-xlfkz http://function-sample-serving-9sszk-ksvc-xlfkz.default.example.com
$ vim /etc/hosts

$ curl http://function-sample-serving-9sszk-ksvc-xlfkz.default.example.com
Hello, World!
```

# KubeSphere + Nebula Graph

```
curl -sL nebula-kind.siwei.io/install-ks-1.sh | bash # kubesphere-all-in-one nebula installer
```

```
$ kubectl get svc nebula-graphd-svc-nodeport
NAME                  TYPE      CLUSTER-IP      EXTERNAL-IP      PORT(S)          AGE
nebula-graphd-svc-nodeport   NodePort  10.233.62.198  <none>           9669:32669/TCP,19669:32001/TCP  3m57s
$ kubectl edit svc nebula-graphd-svc-nodeport
service/nebula-graphd-svc-nodeport edited
$ ~/.nebula-kind/bin/console -u root -p password --address=192.168.8.137 --port=32669
2021/09/01 20:38:39 [INFO] connection pool is initialized successfully
Welcome to Nebula Graph!
```

```
(root@nebula) [(none)]> show hosts
+-----+-----+-----+-----+-----+
| Host | Port | Status | Leader count | Leader dist |
+-----+-----+-----+-----+-----+
| "nebula-storaged-0.nebula-storaged-headless.default.svc.cluster.local" | 9779 | "ONLINE" | 0 | "No valid pa
+-----+-----+-----+-----+-----+
| "nebula-storaged-1.nebula-storaged-headless.default.svc.cluster.local" | 9779 | "ONLINE" | 0 | "No valid pa
+-----+-----+-----+-----+-----+
| "nebula-storaged-2.nebula-storaged-headless.default.svc.cluster.local" | 9779 | "ONLINE" | 0 | "No valid pa
+-----+-----+-----+-----+-----+
| "Total" | | | 0 | |
+-----+-----+-----+-----+-----+
```

# Nebula Graph 数据导入

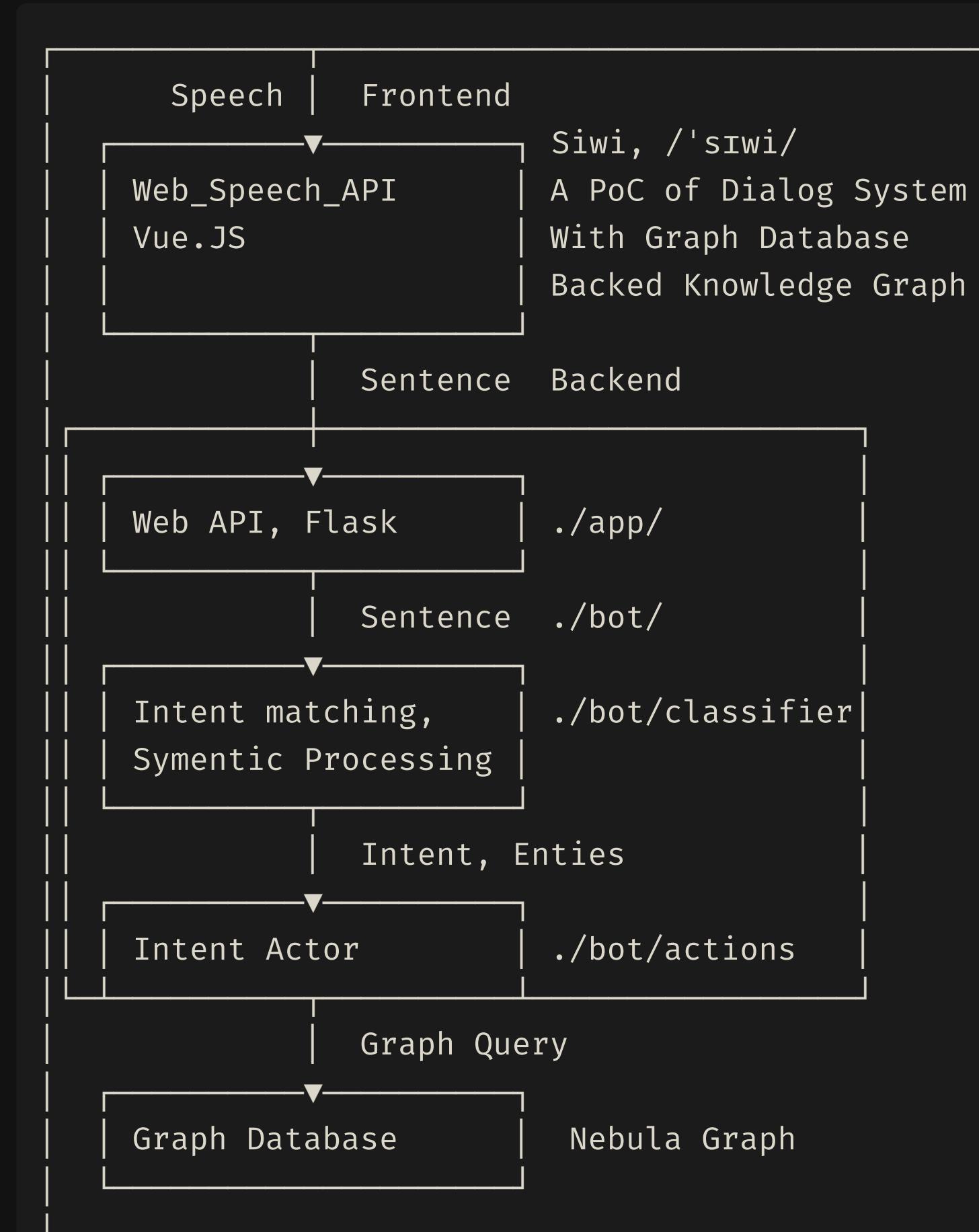
```
$ wget https://docs.nebula-graph.io/2.0/basketballplayer-2.X.ngql
$ ~/.nebula-kind/bin/console -u root -p password --address=192.168.8.137 --port=32669 -f basketballplayer-2.X.ngql
...
(root@nebula) [basketballplayer]> insert edge serve(start_year,end_year) values "player150"->"team213":(2018, 2019);
Execution succeeded (time spent 946/1091 us)
Wed, 01 Sep 2021 20:47:58 UTC
```

```
[root@wey wey.gu]# ~/.nebula-kind/bin/console -u root -p password --address=192.168.8.137 --port=32669
(root@nebula) [(none)]> show spaces
+-----+
| Name |
+-----+
| "basketballplayer" |
+-----+
(root@nebula) [(none)]> use basketballplayer
(root@nebula) [basketballplayer]> show tags
+-----+
| Name   |
+-----+
| "player" |
+-----+
| "team"  |
+-----+
```

# Siwi on KubeSphere + OpenFunction

Siwi (/s̩iwi/) is a PoC of Dialog System With Graph Database Backed Knowledge Graph.

## ARCH



## CODE

```
.├── README.md  
├── src  
│   ├── siwi  
│   │   ├── app  
│   │   └── bot  
│   │       ├── actions  
│   │       ├── bot  
│   │       ├── classifier  
│   │       └── test  
│   └── siwi_frontend  
│       ├── README.md  
│       ├── package.json  
│       └── src  
│           ├── App.vue  
│           └── main.js  
└── wsgi.py
```



[wey-gu/nebula-siwi](https://github.com/wey-gu/nebula-siwi)

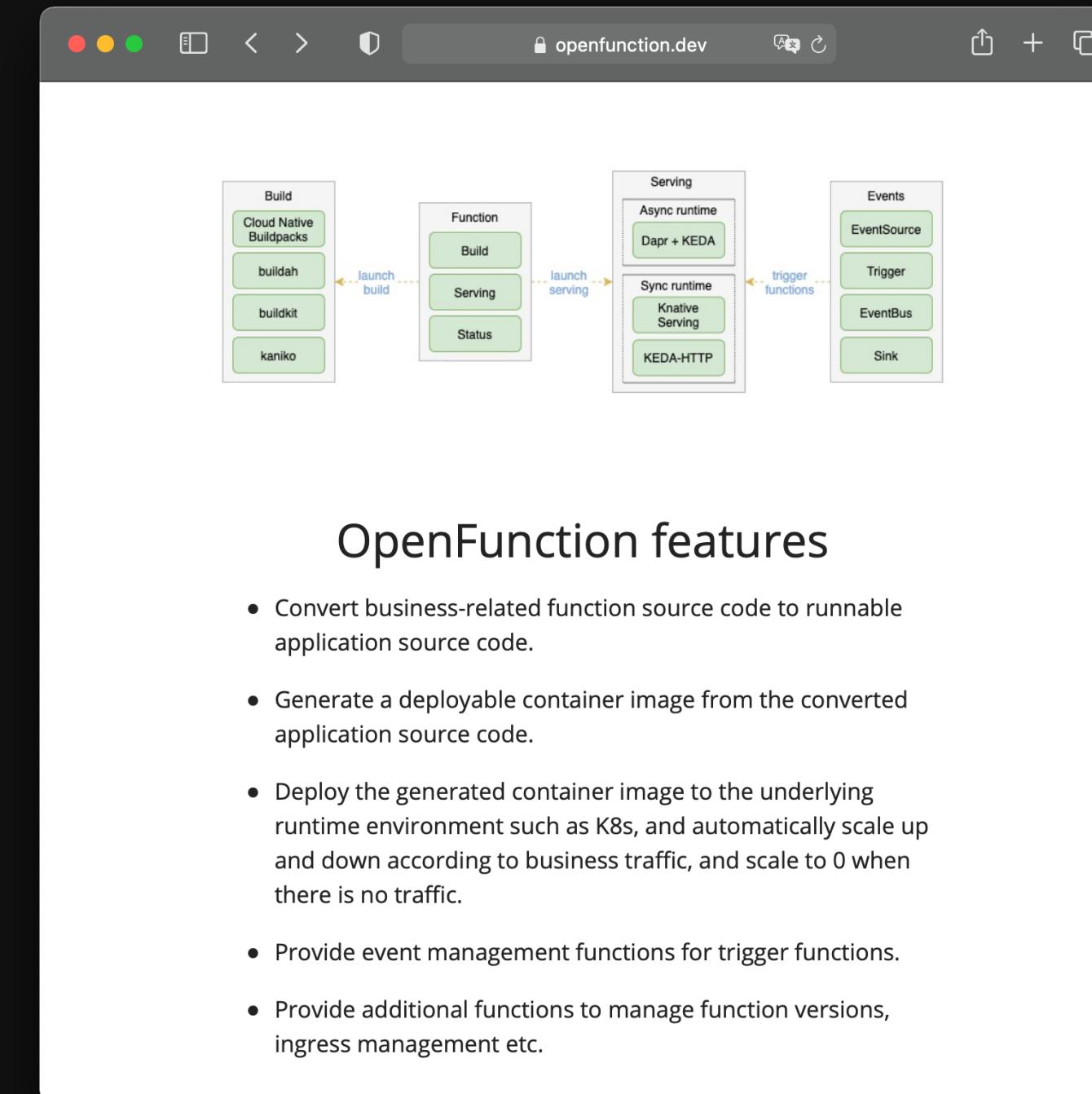
# Live Demo

Siwi on KubeSphere + OpenFunction

# The Function

```
docker build -t weygu/siwi-api .
docker push weygu/siwi-api
```

```
apiVersion: core.openfunction.io/v1alpha1
kind: Function
metadata:
  name: nebula-siwi
spec:
  version: "v1.0.0"
  image: "weygu/siwi-api:latest"
  imageCredentials:
    name: push-secret
  port: 5000
  serving:
    runtime: Knative
    template:
      containers:
        - name: function
      imagePullPolicy: Always
```



# 回顾

- 图、图数据库简介
- Nebula Graph!
- Nebula Operator
- KubeSphere 上的图数据库
- KubeSphere 上的 OpenFunction
- Siwi, 一个基于 Nebula 的单一领域问答机器人
- Nebula-Siwi on FaaS on KubeSphere

 [wey-gu](#)

 [wey\\_gu](#)

 [siwei.io](#)

# “获取关于 Nebula Graph 的有用信息



微信公众号，Nebula Graph 的最新信息 ->



文档：[docs.nebula-graph.com.cn](https://docs.nebula-graph.com.cn)

Nebula Graph 架构、实践文章：[nebula-graph.com.cn/posts](https://nebula-graph.com.cn/posts)



视频和教程：[space.bilibili.com/472621355](https://space.bilibili.com/472621355)

入门文章索引：[zhuanlan.zhihu.com/p/368781105](https://zhuanlan.zhihu.com/p/368781105)

**用户问答论坛：**[discuss.nebula-graph.com.cn](https://discuss.nebula-graph.com.cn)



[github.com/vesoft-inc/nebula](https://github.com/vesoft-inc/nebula)



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谢谢



[github.com/kubesphere](https://github.com/kubesphere)



[twitter.com/kubesphere](https://twitter.com/kubesphere)



[UP/KubeSphere](#)



[kubesphere.io](https://kubesphere.io)



[kubesphere.slack.com](https://kubesphere.slack.com)