

构建微服务云原生应用

架构师杨波



扫码试看/订阅

《Spring Boot & Kubernetes 云原生微服务实践》

CHAPTER

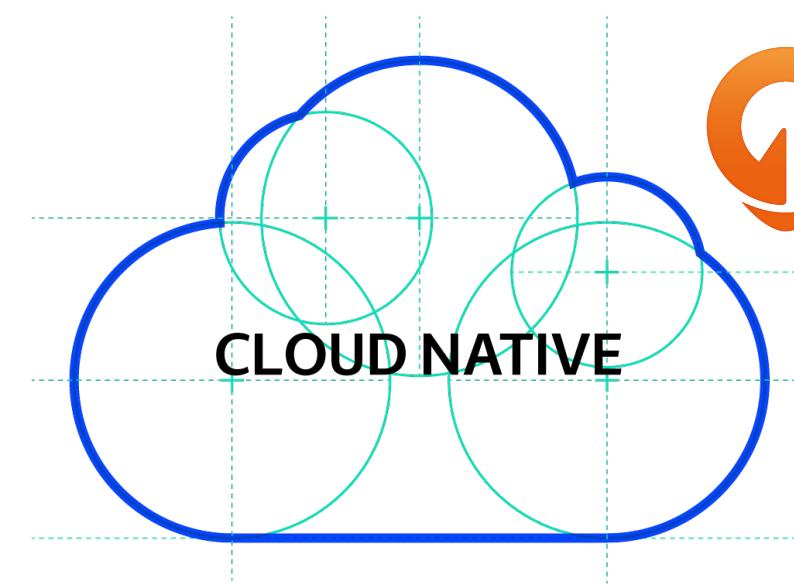
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云原生架构和 Kubernetes 容器云部署

第 1 部分

到底什么是云原生架构？

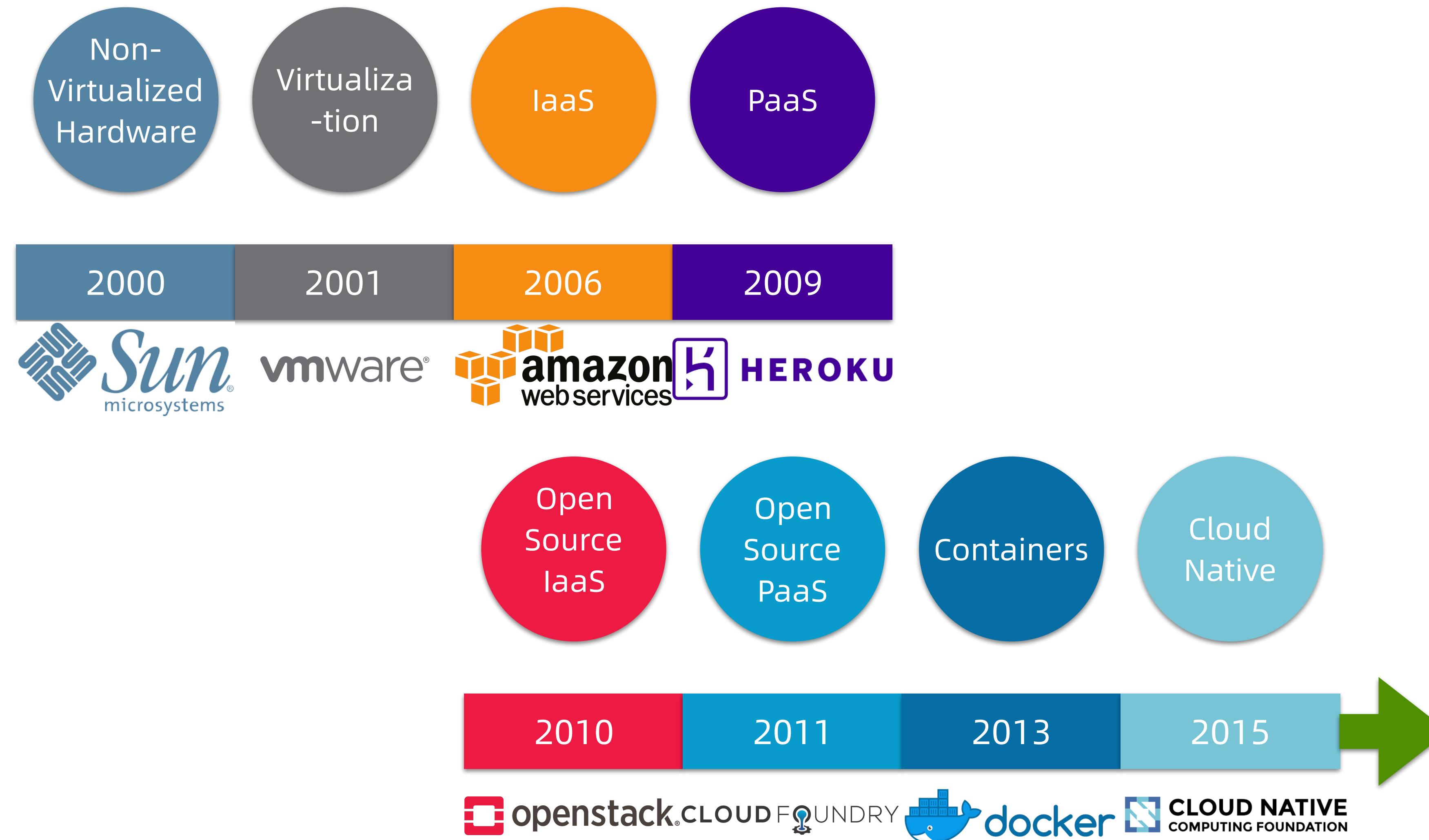
云原生（Cloud Native）应用定义



- Applications adopting the principles of Microservices packaged as Containers orchestrated by Platforms running on top of Cloud infrastructure, developed using practices such as Continuous Delivery and DevOps.
- 基于微服务原理而开发的应用，以容器方式打包。在运行时，容器由运行于云基础设施之上的平台进行调度。应用开发采用持续交付和 DevOps 实践。

<https://www.slideshare.net/bibryam/designing-cloud-native-applications-with-kubernetes>

云演进史



CNCF



cncf.io

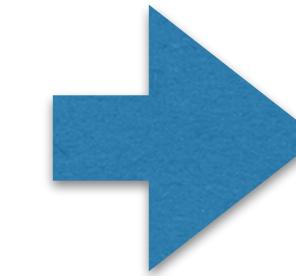
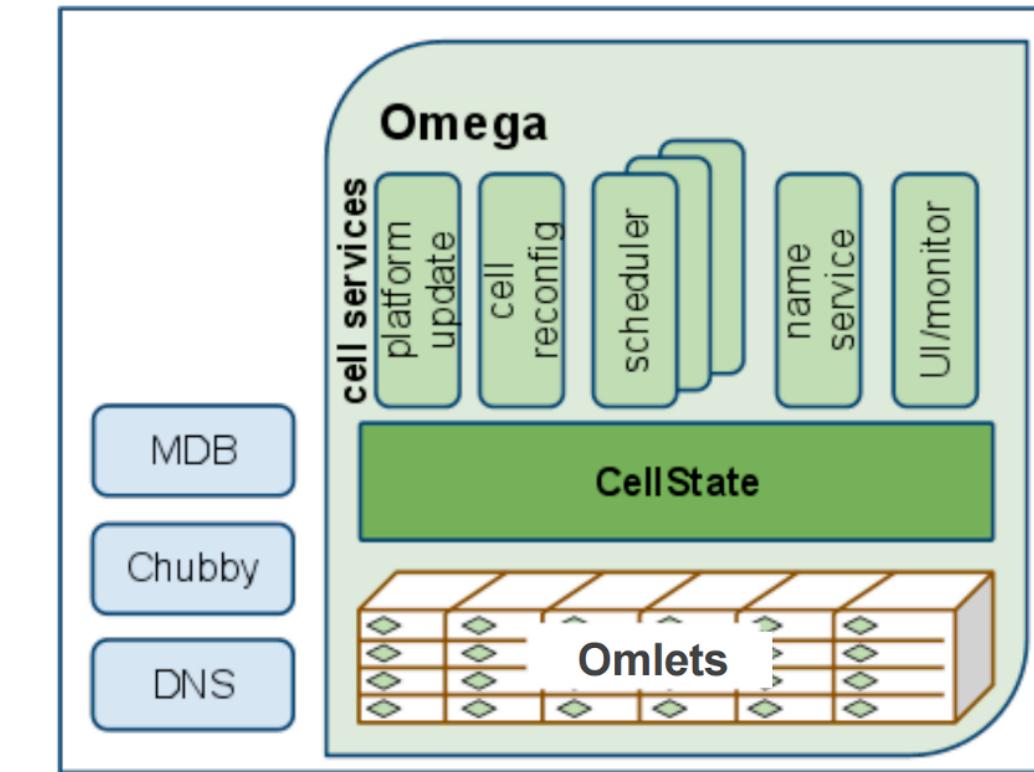
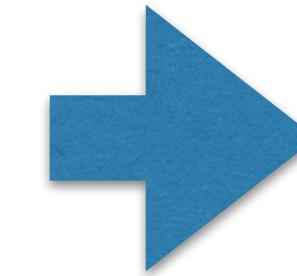
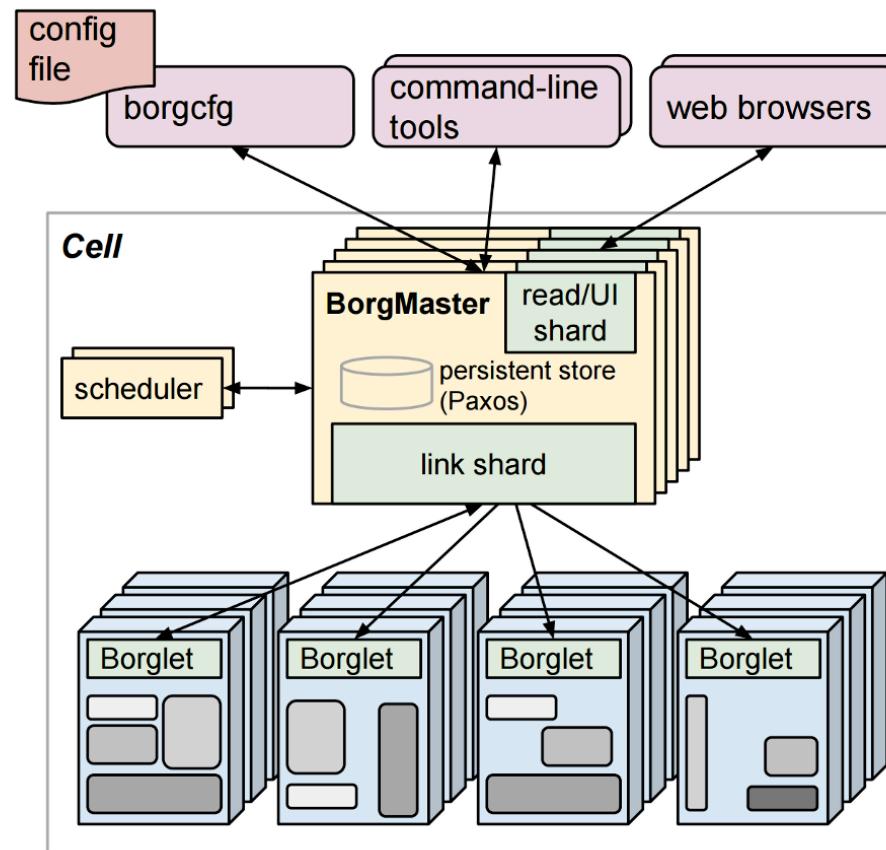
landscape.cncf.io

第 2 部分

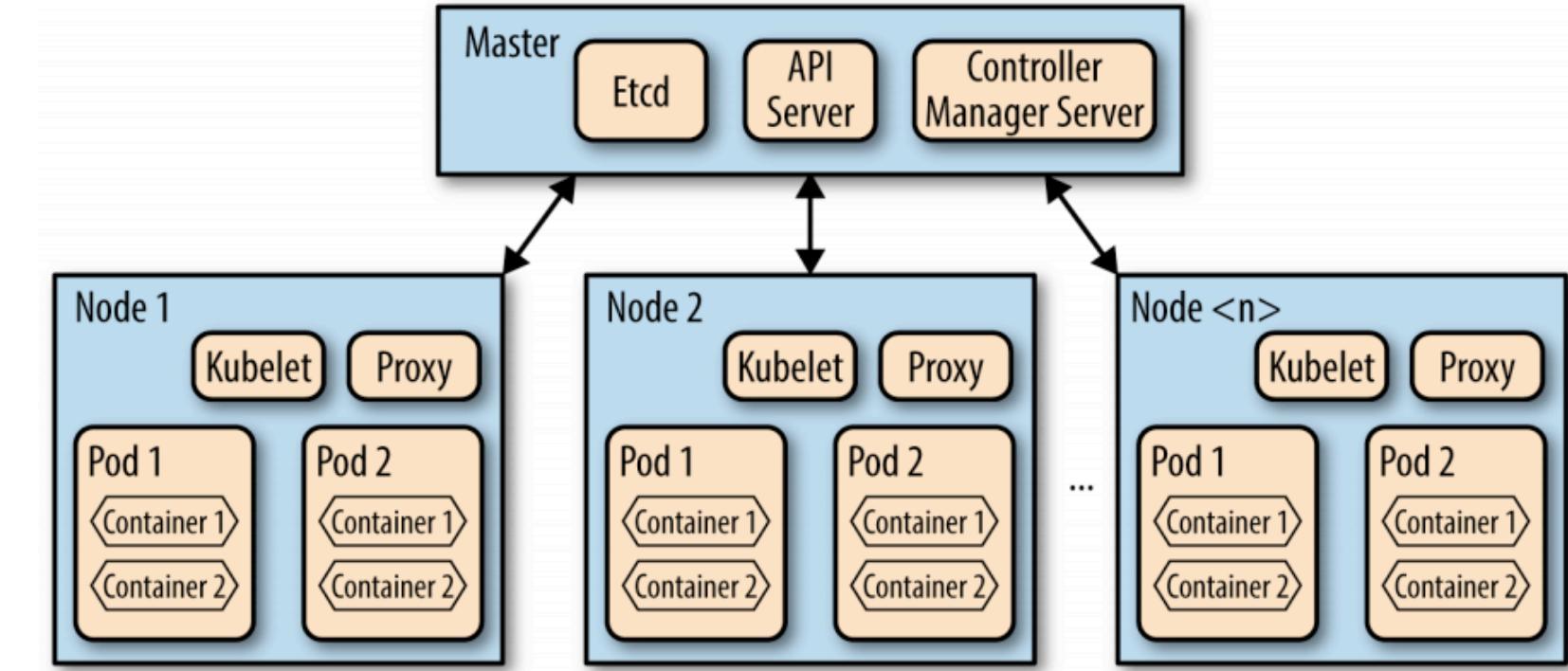
Kubernetes 背景和架构

Kubernetes 历史

2003/2004



2014



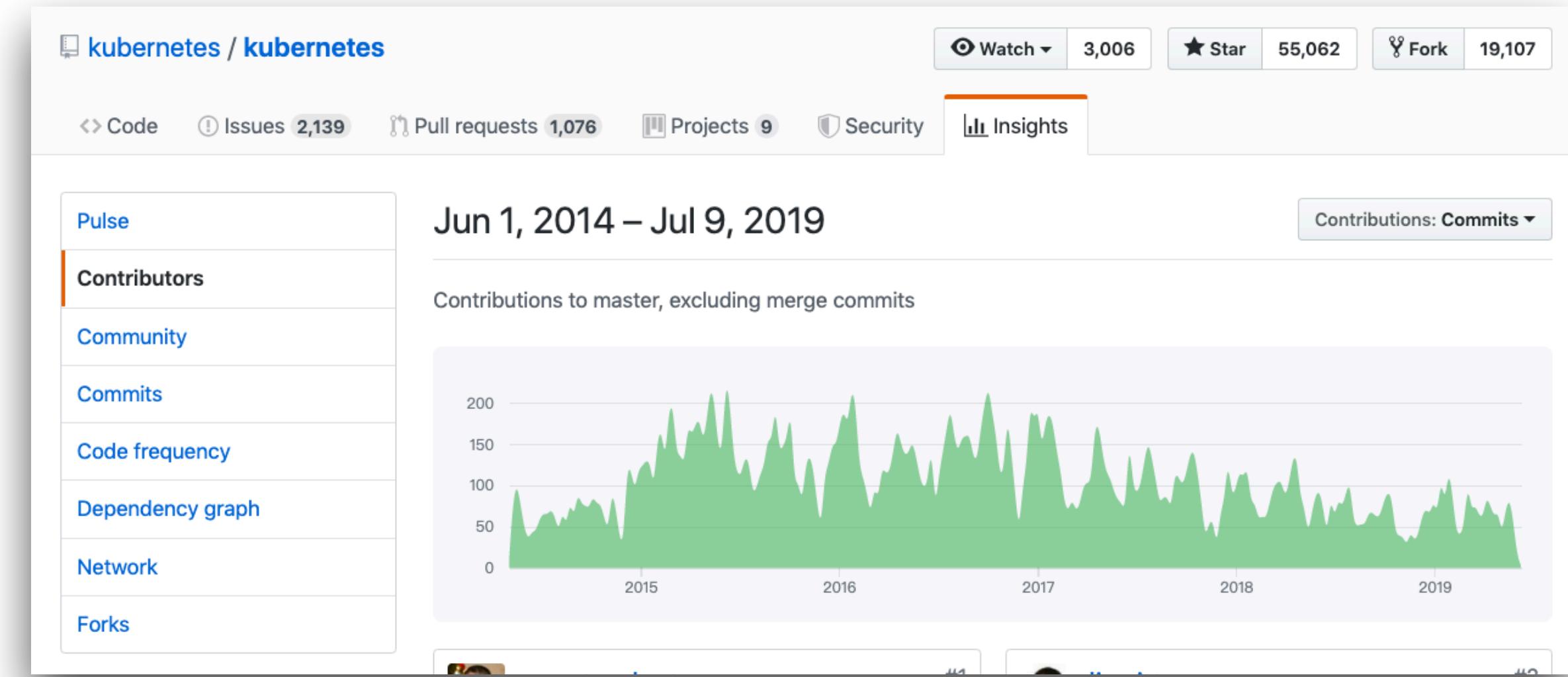
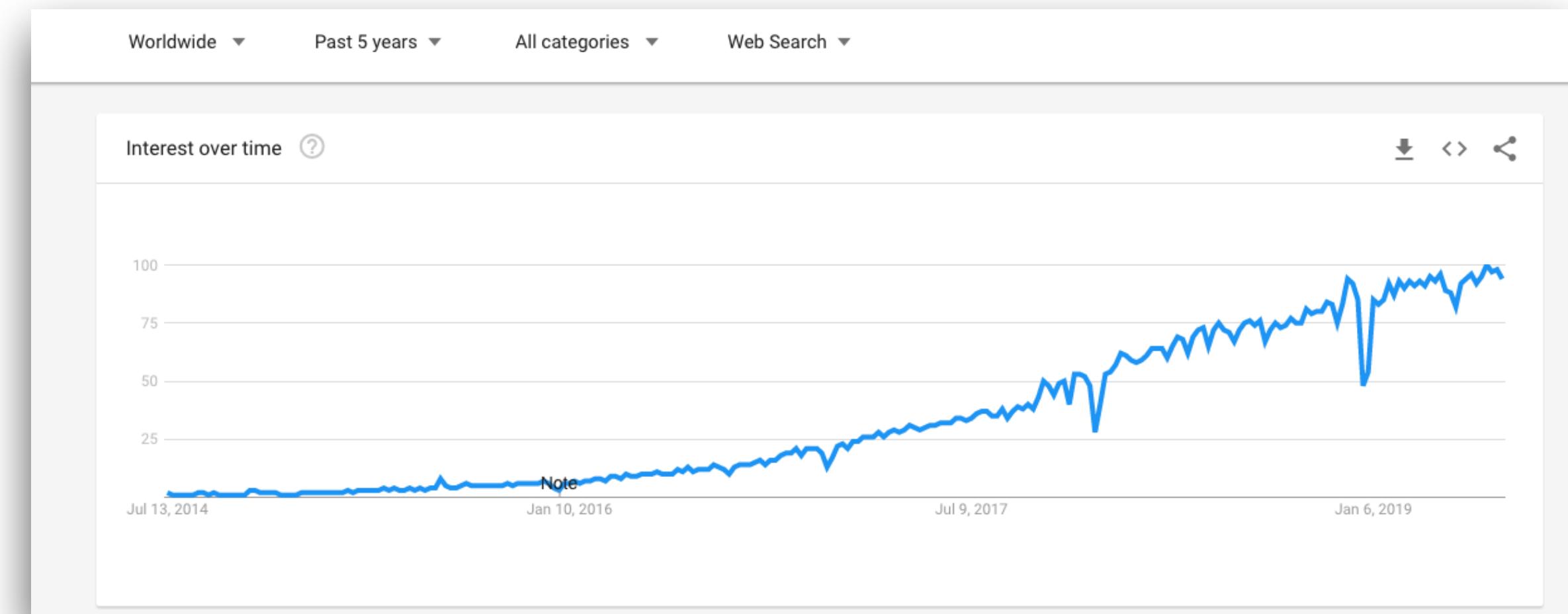
<https://medium.com/containermind/a-new-era-of-container-cluster-management-with-kubernetes-cd0b804e1409>

Google 特有的方式

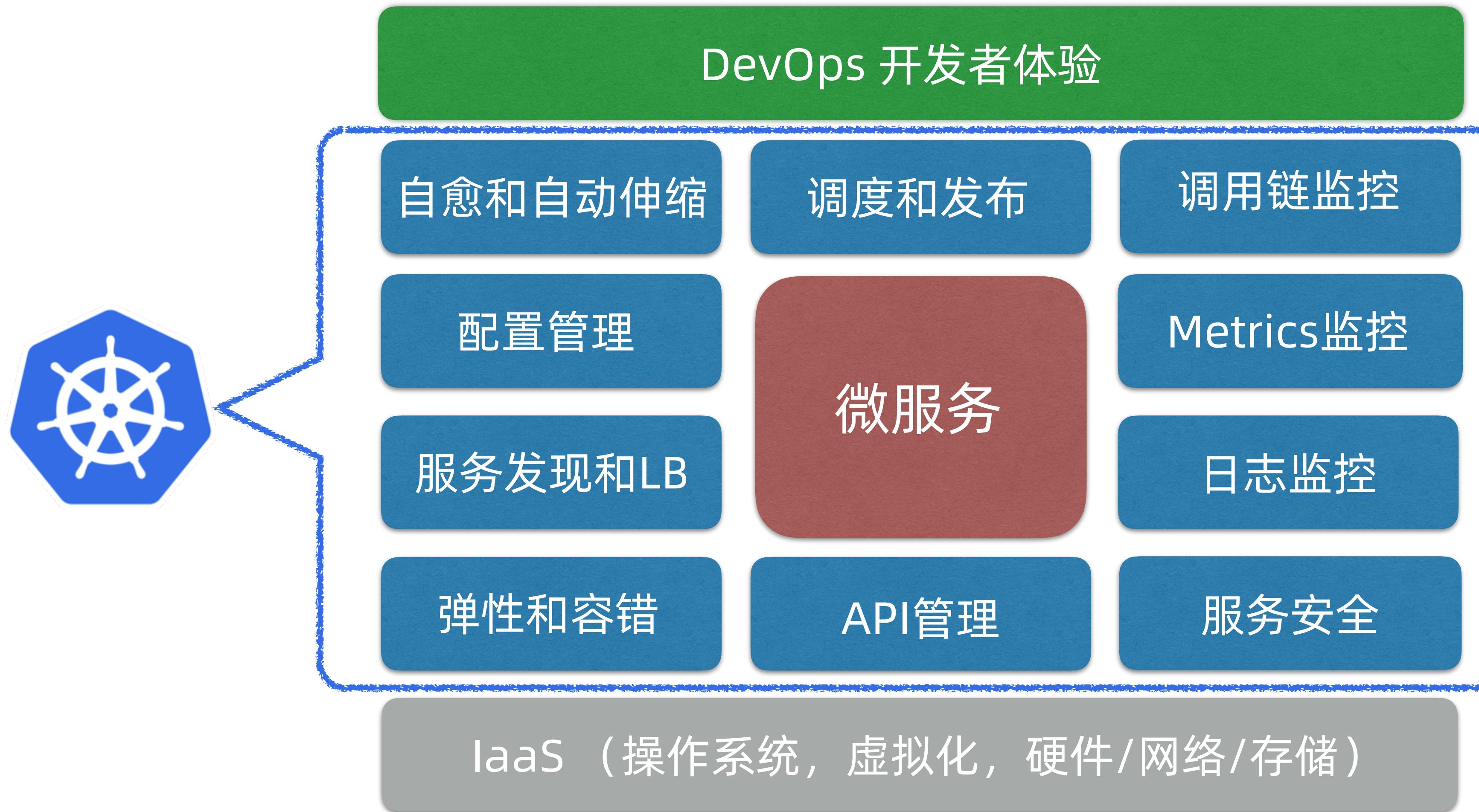
从 Gmail 到 YouTube 和 Google 搜索，Google 的所有产品都是在容器中运行。容器化让我们的开发团队可以快速行动、高效部署软件，并以前所未有的规模运营。每个星期我们都要启动超过 20 亿个容器。这十年来，我们不但积累了有关如何在生产环境中运行容器化工作负载的丰富知识，而且一直与社区积极分享这些知识：从早期为 Linux 内核贡献 cgroups，到在 Kubernetes 项目中开放我们内部工具所采用的设计源代码，均是如此。我们将这些专业知识融入 Google Cloud Platform，使任何规模的开发者和企业都能轻松利用最新的容器技术创新成果。

<https://cloud.google.com/containers/?hl=zh-cn>

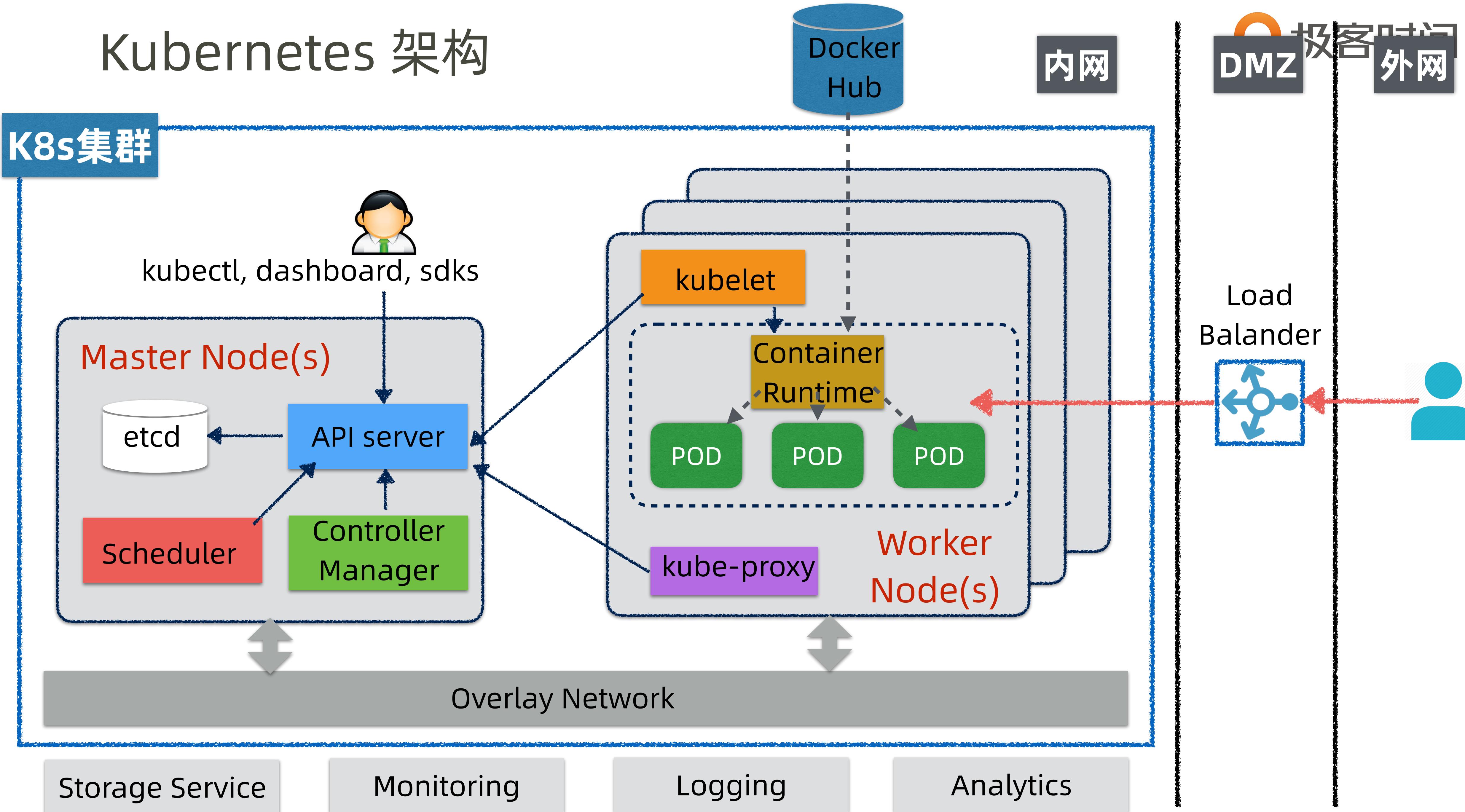
Kubernetes 趋势



Kubernetes 解决什么问题？



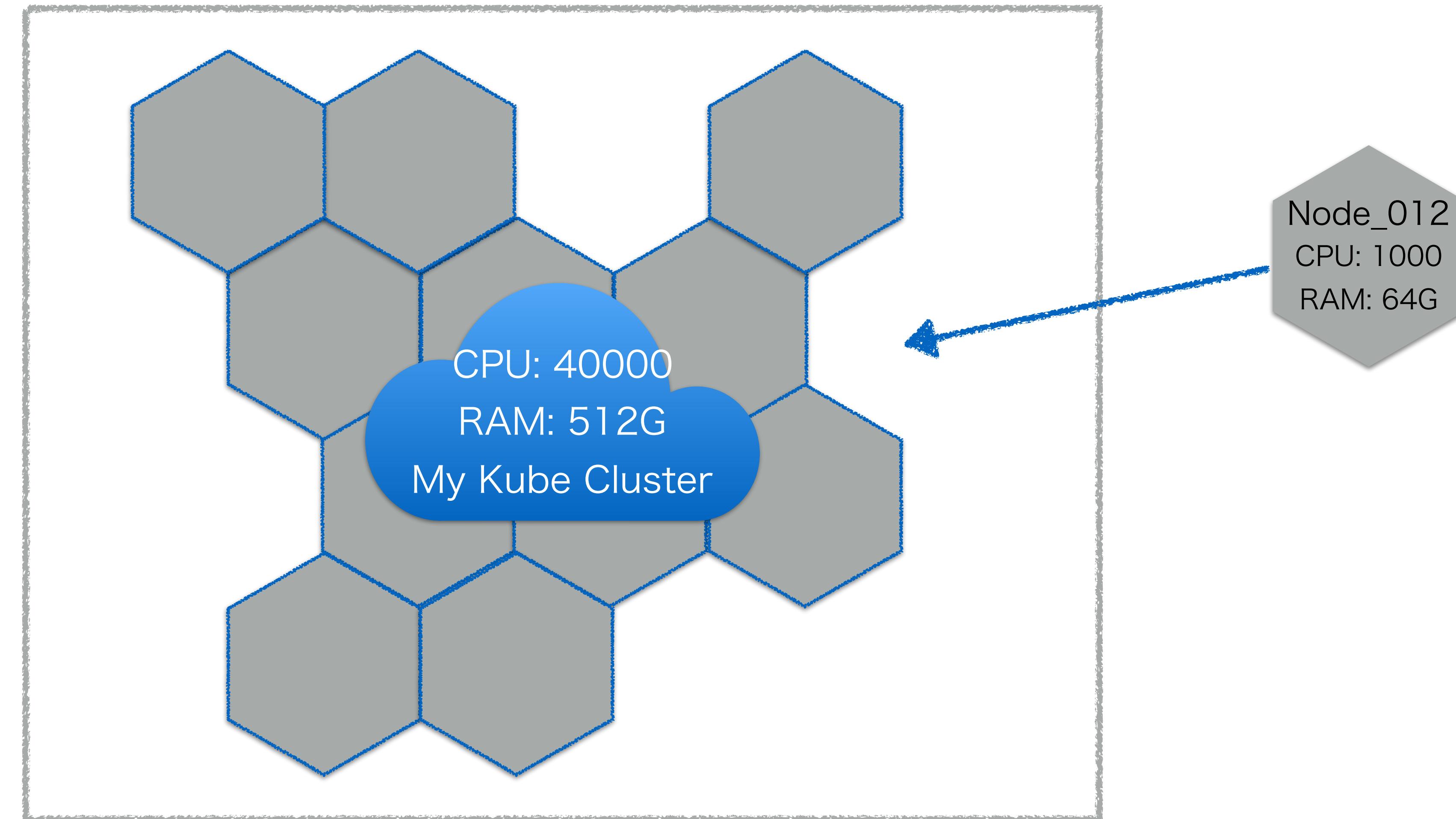
Kubernetes 架构



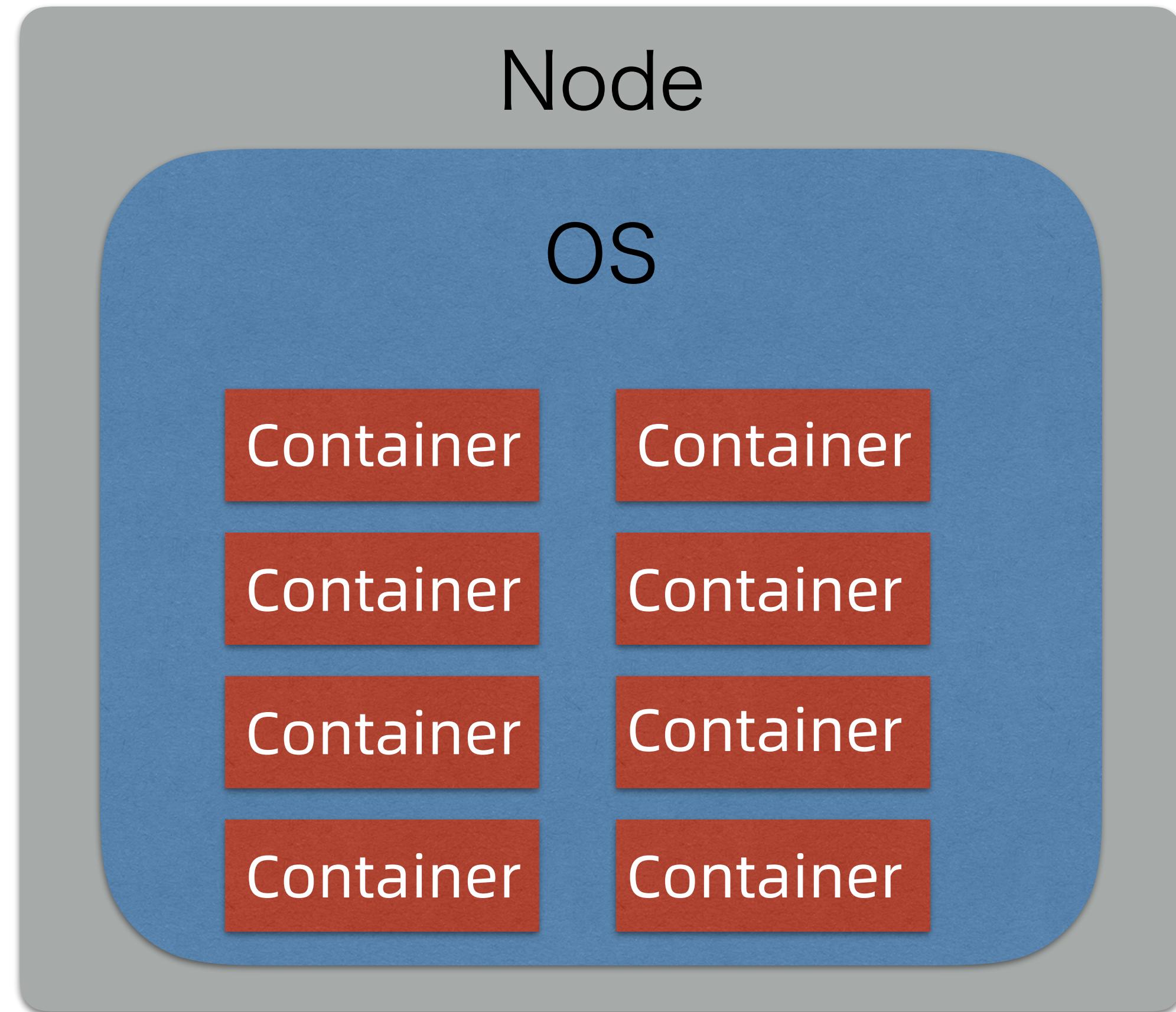
第 3 部分

Kubernetes 有哪些基本概念？

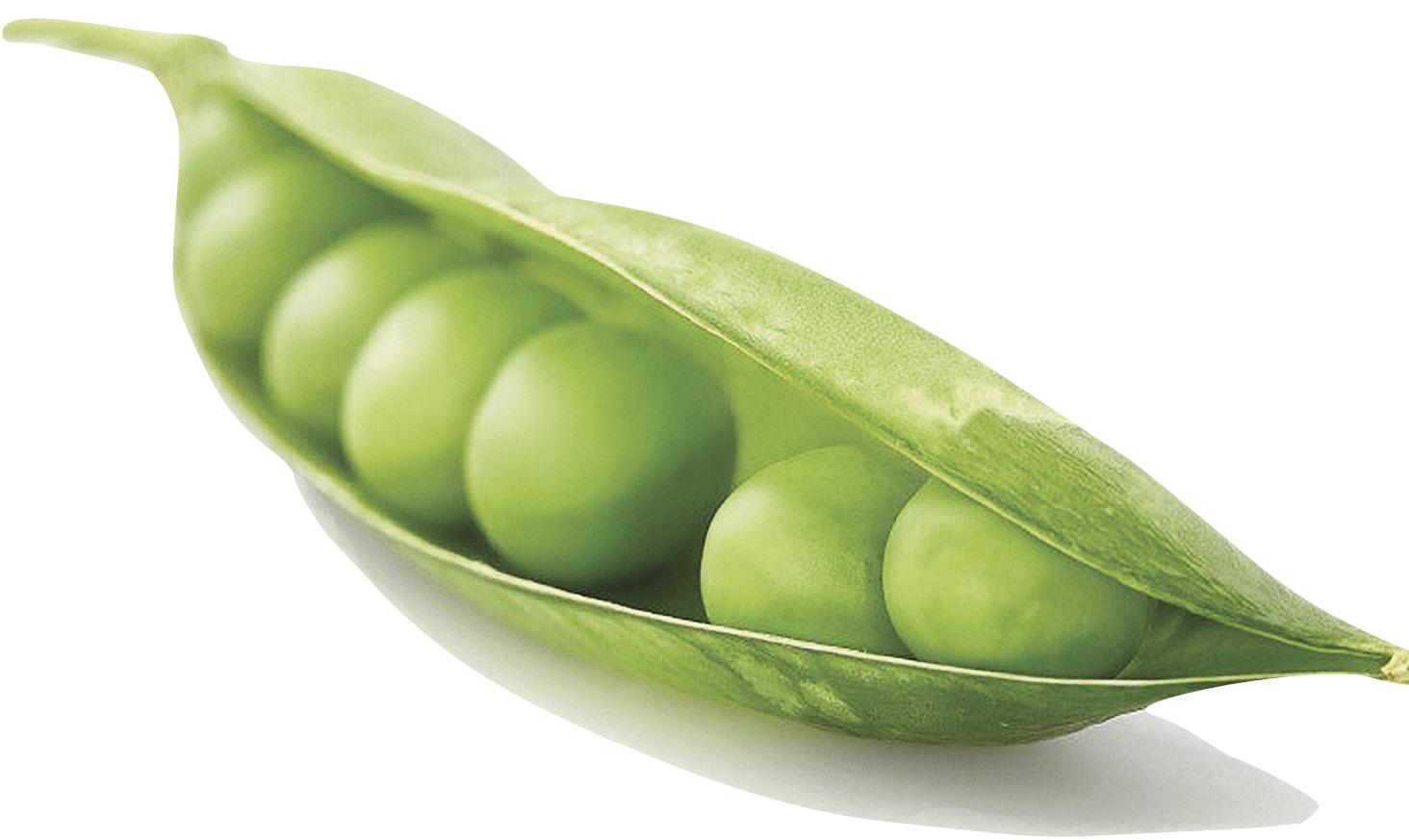
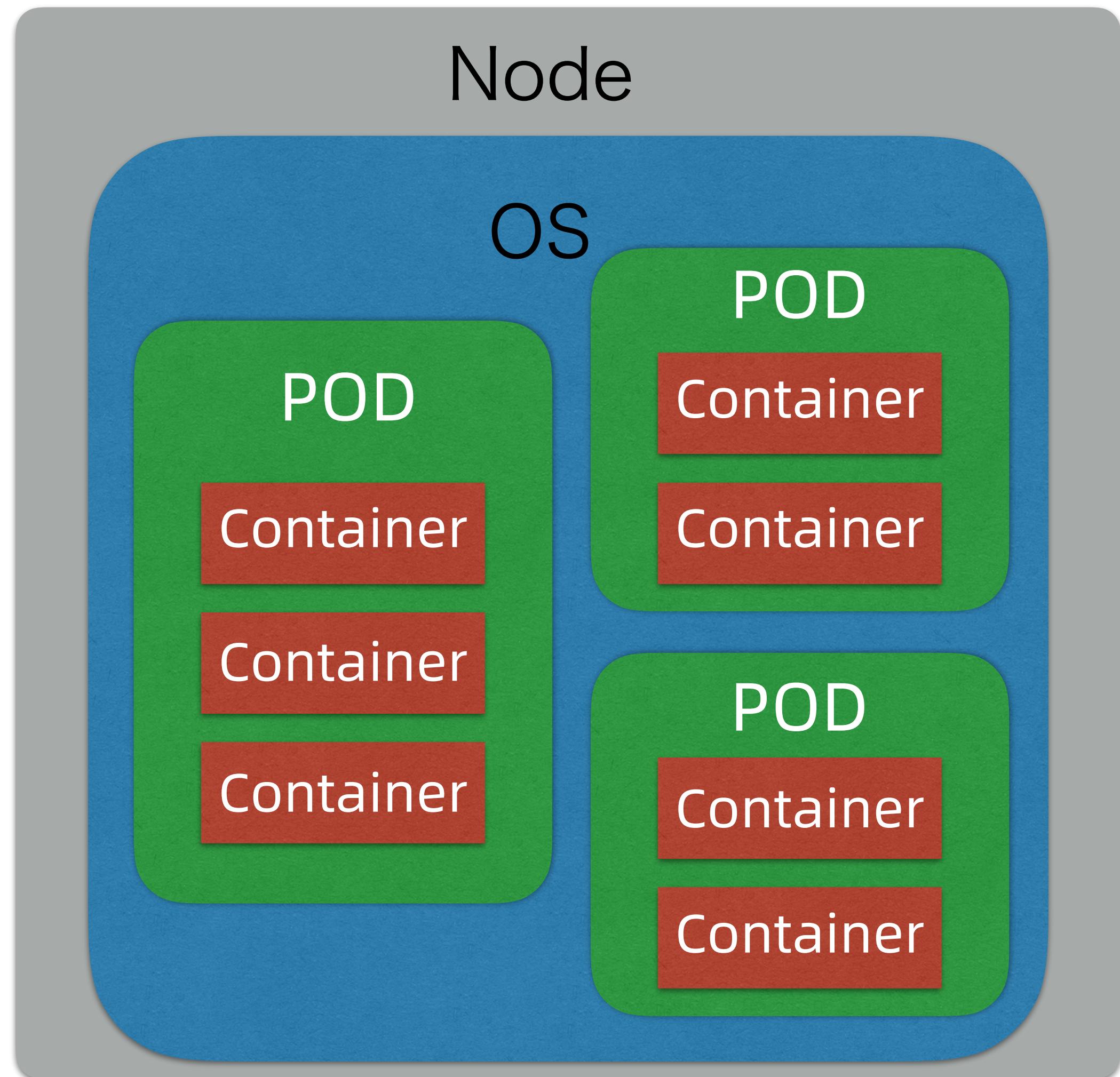
Kubernetes 集群 (Cluster)



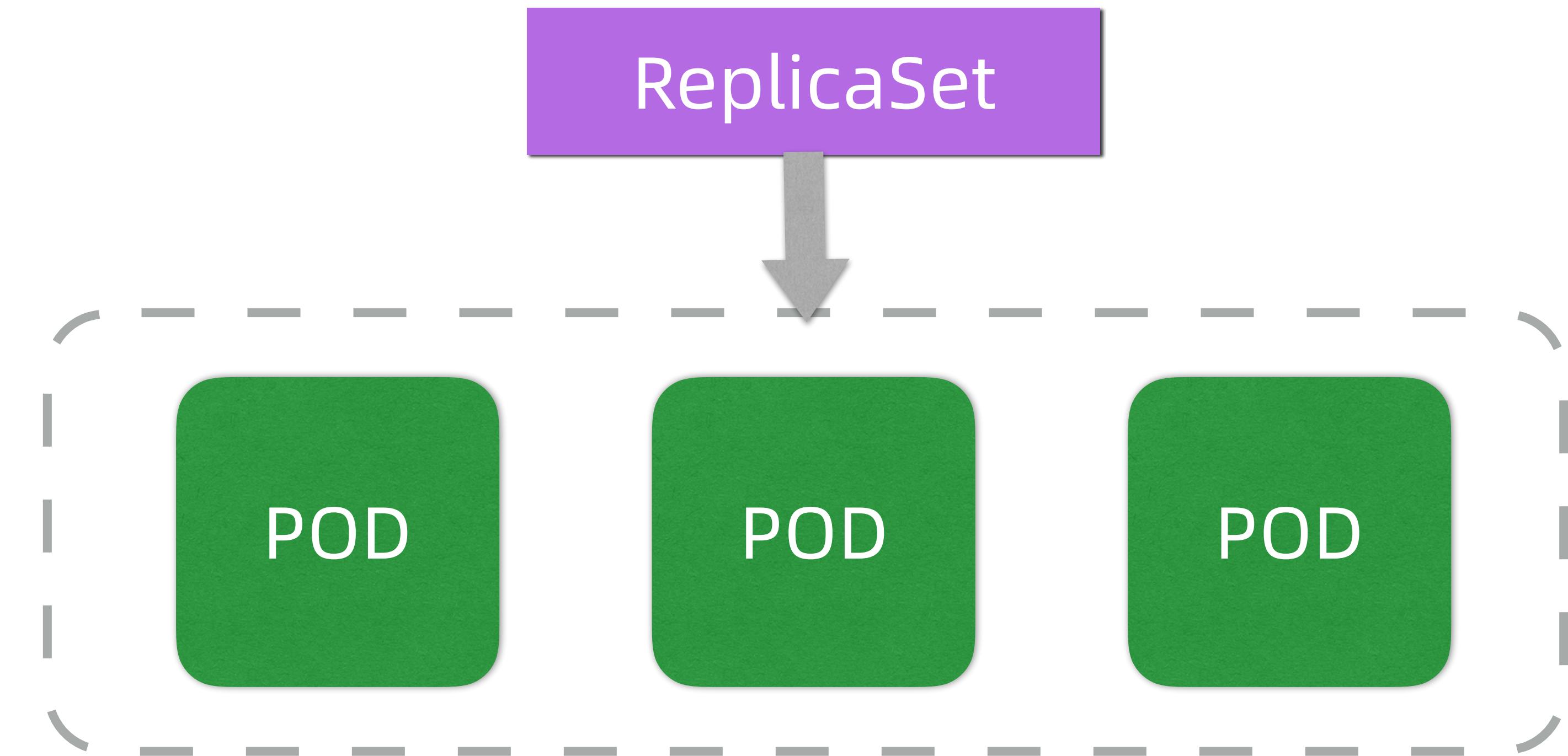
容器 Container



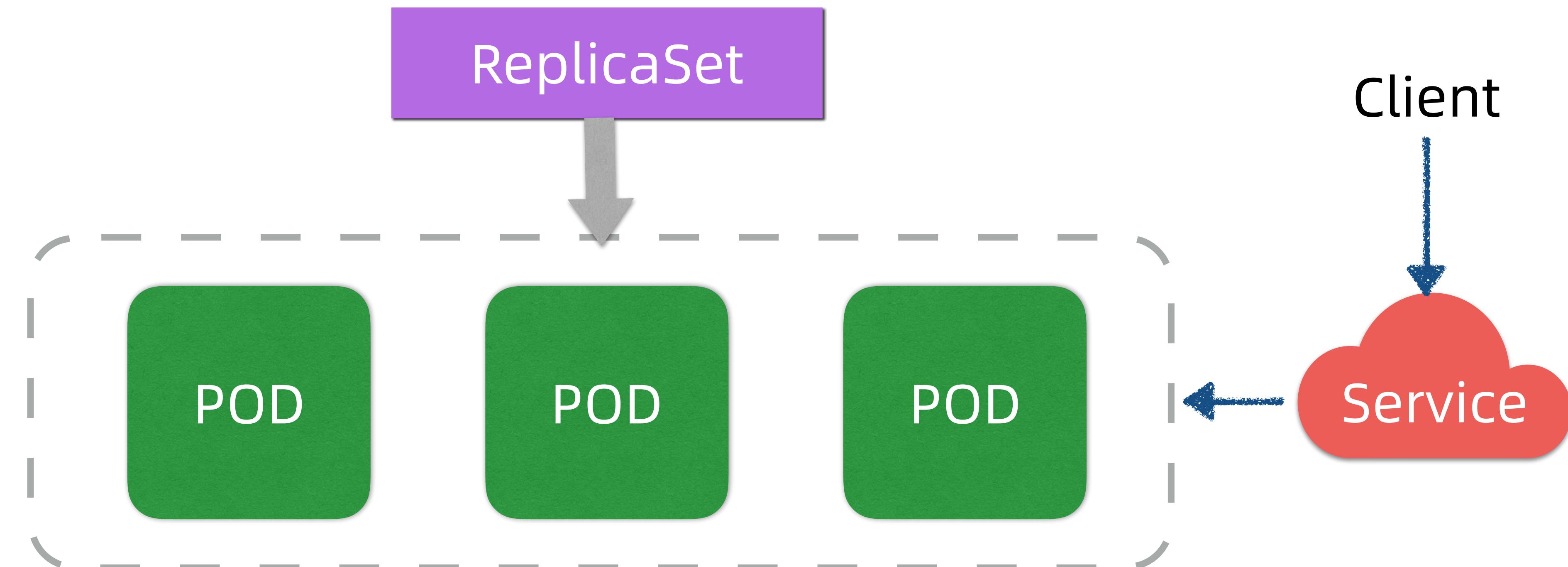
POD



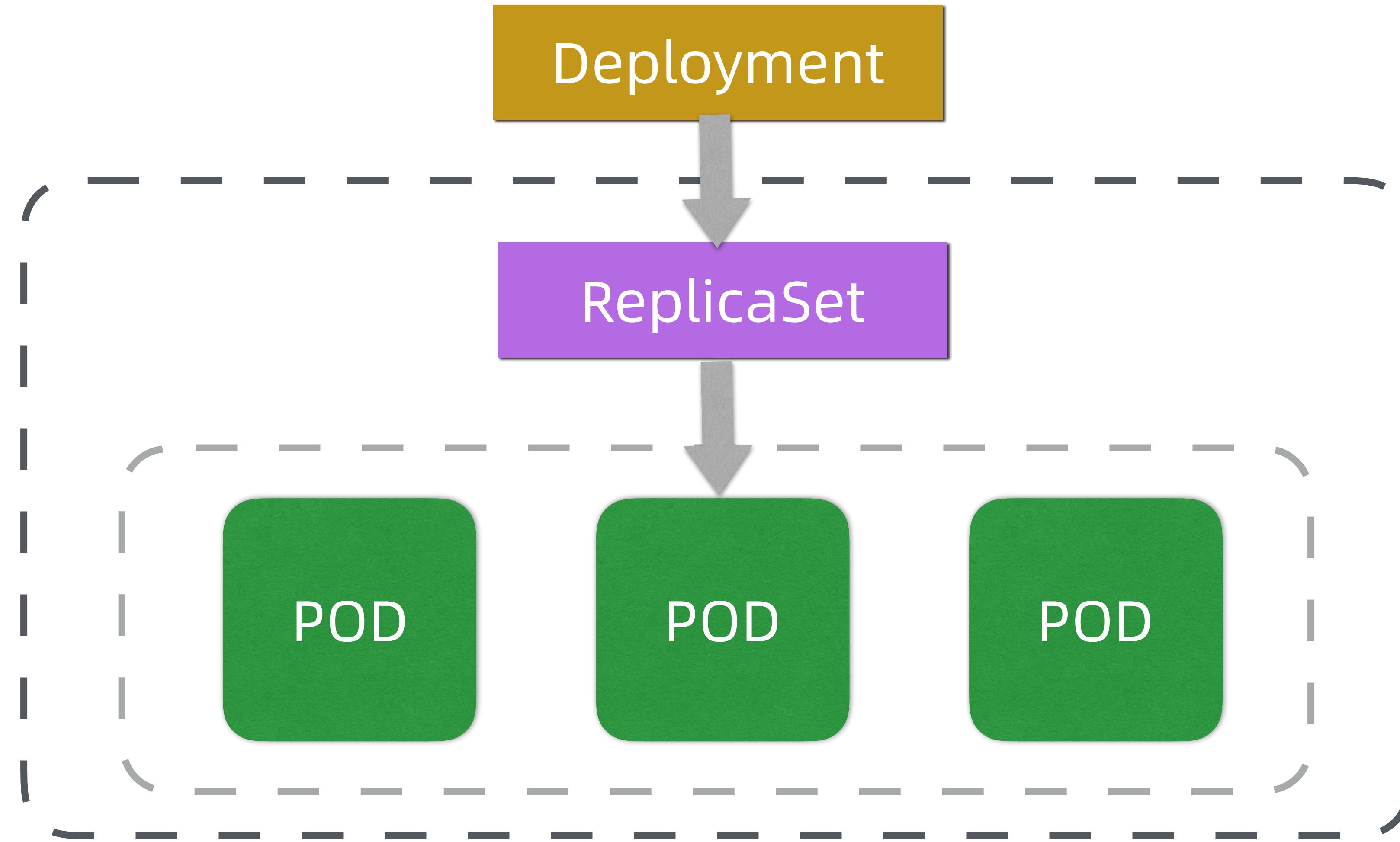
副本集 ReplicaSet



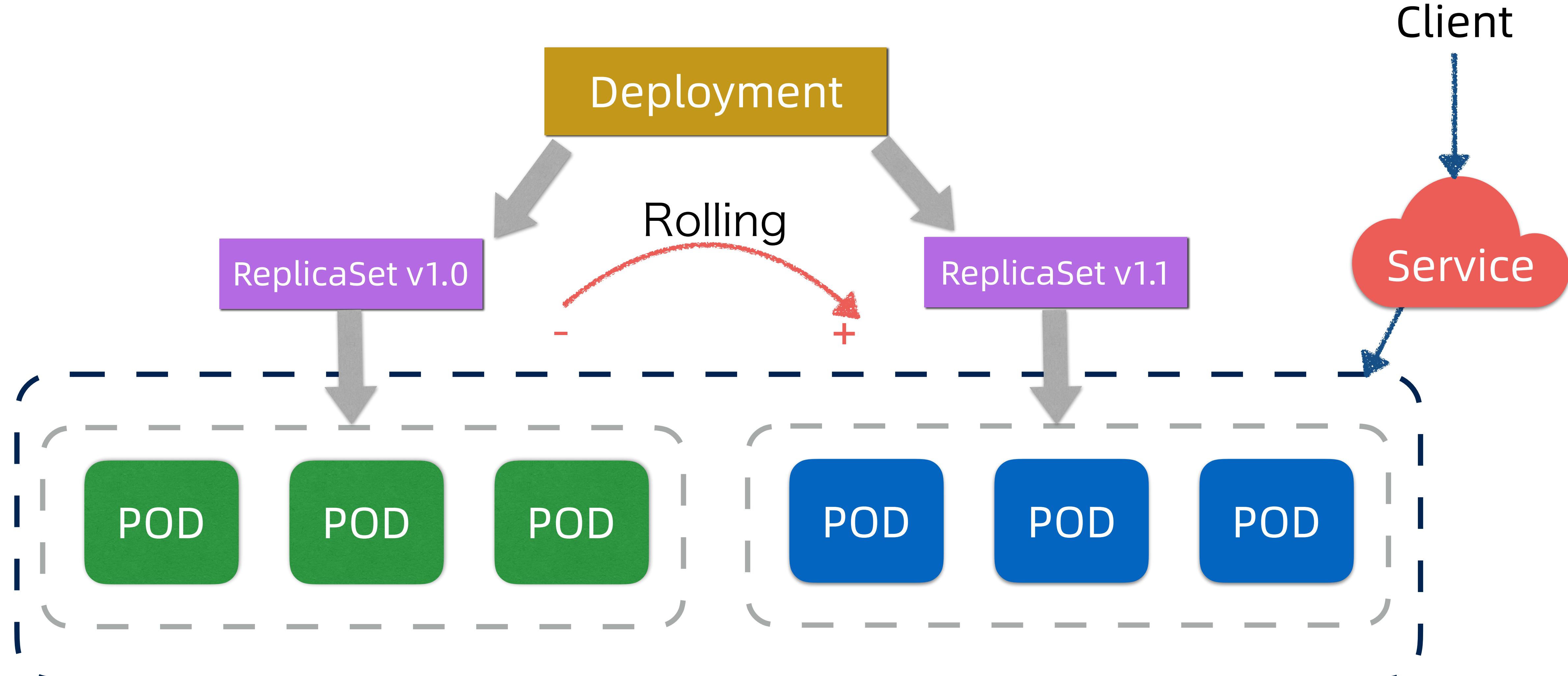
服务 Service



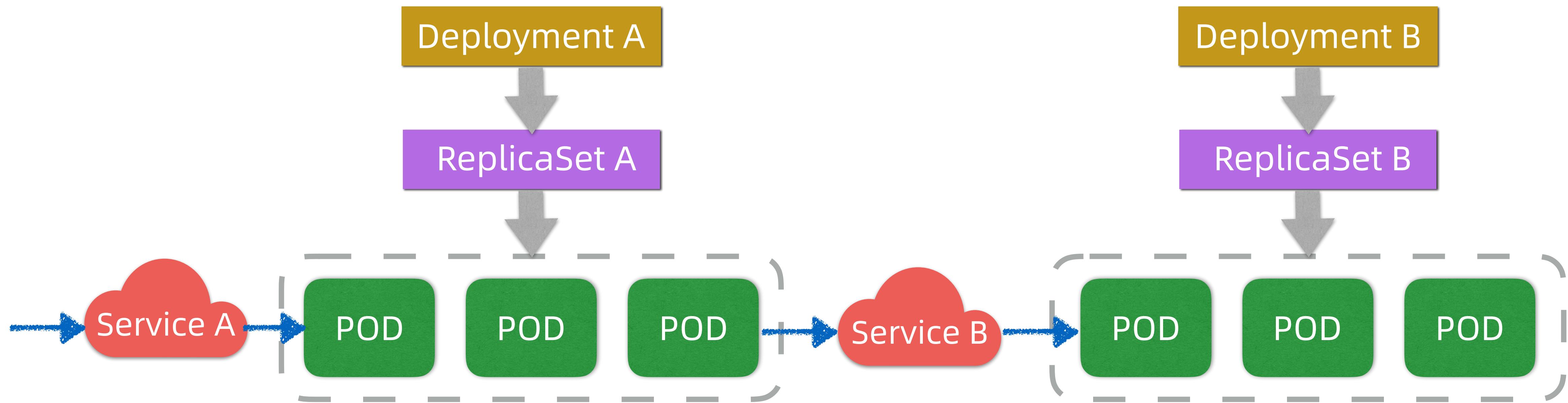
发布 Deployment



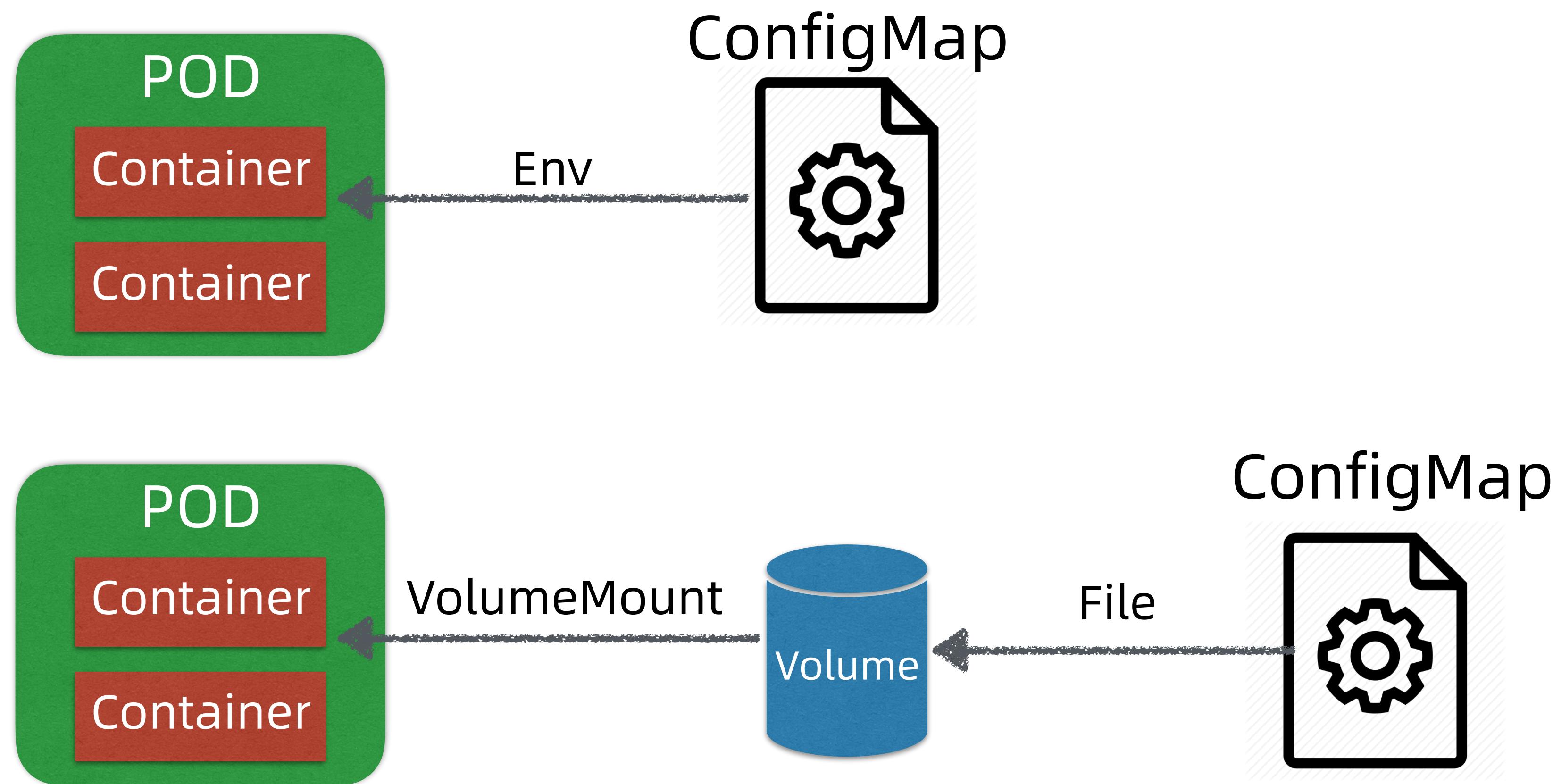
滚动发布 Rolling Update



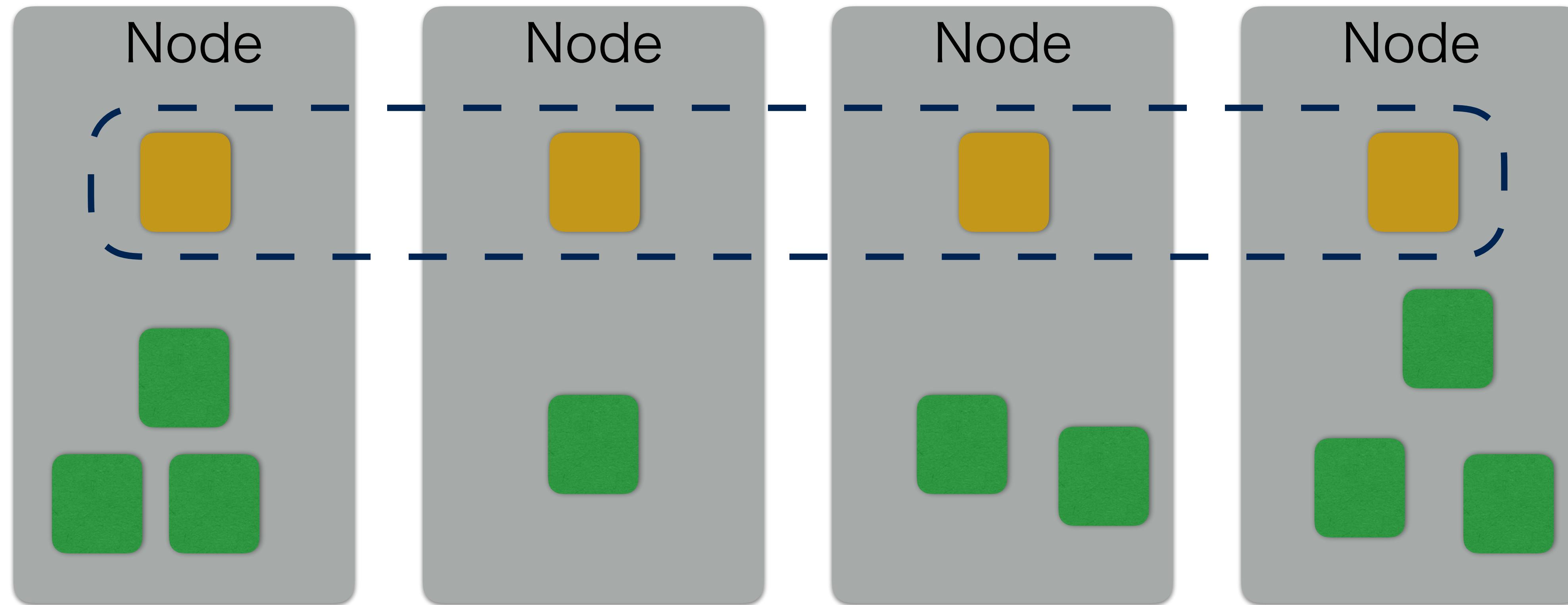
发布和服务总结



ConfigMap/Secret

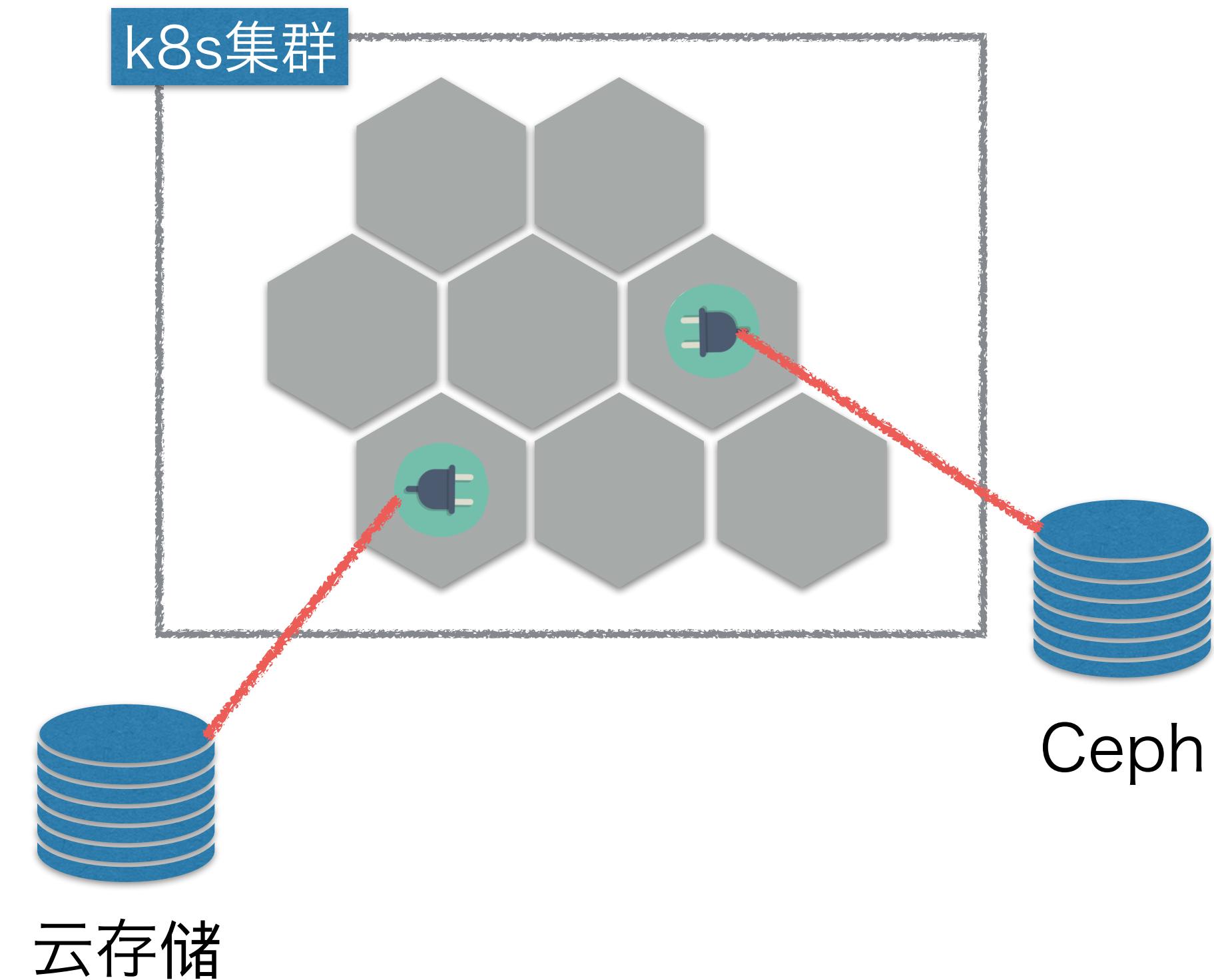
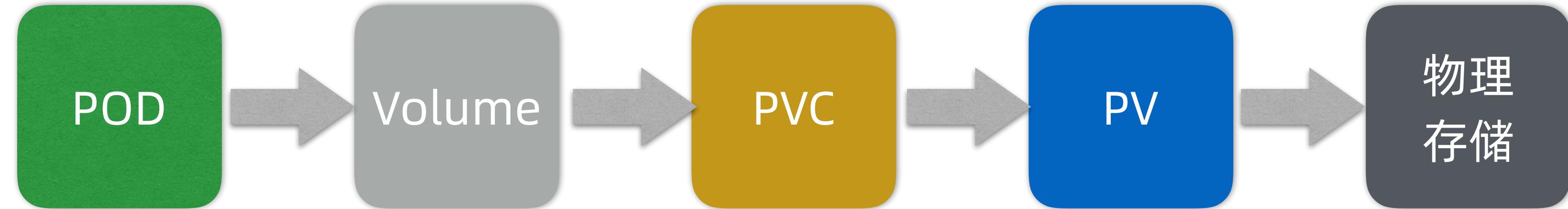


DaemonSet



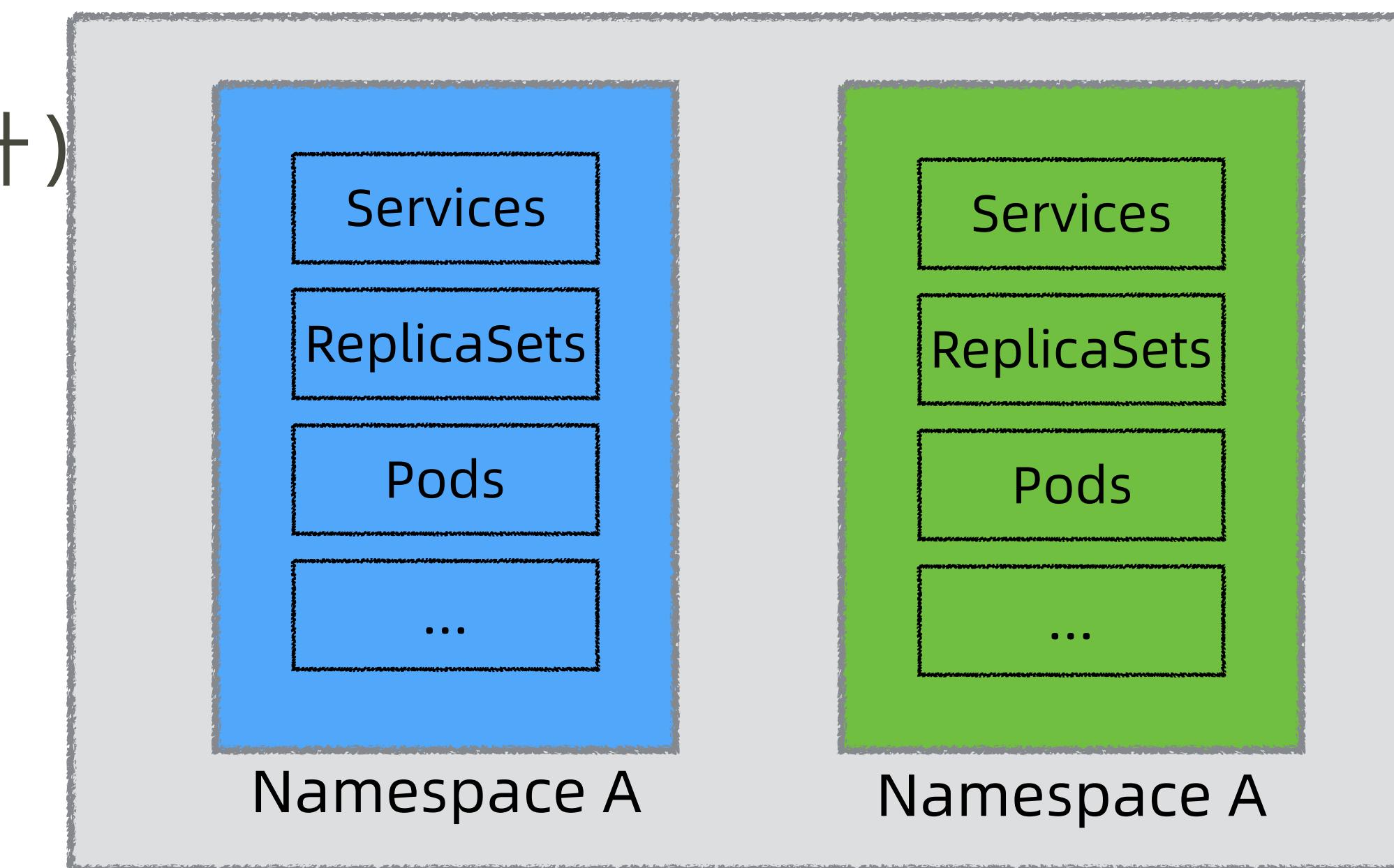
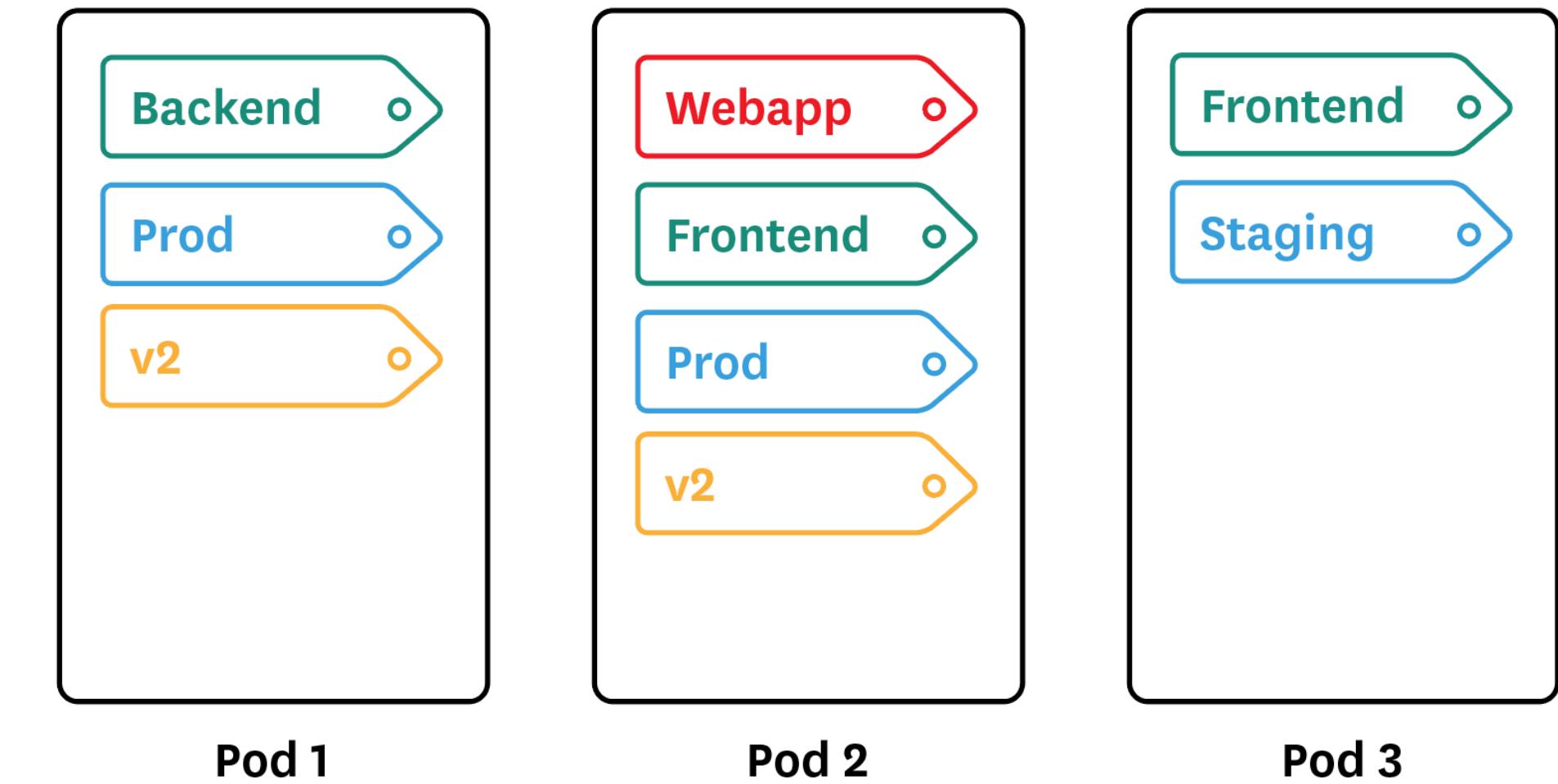
其它概念

- Volume
- PersistentVolume
- PersistentVolumeClaims
- StatefulSet
- Job
- CronJob



概念补充

- Label/Selector
- Namespace
- Readiness Probe (就绪探针)
- Liveness Probe (活跃探针)



Kubernetes Cluster

概念总结1

概念	作用
Cluster	超大计算机抽象，由节点组成
Container	应用居住和运行在容器中
Pod	Kubernetes 基本调度单位
ReplicaSet	创建和管理 Pod，支持无状态应用
Service	应用 Pods 的访问点，屏蔽 IP 寻址和负载均衡
Deployment	管理 ReplicaSet，支持滚动等高级发布机制
ConfigMap/Secrets	应用配置，secret 敏感数据配置
DaemonSet	保证每个节点有且仅有一个 Pod，常见于监控
StatefulSet	类似 ReplicaSet，但支持有状态应用

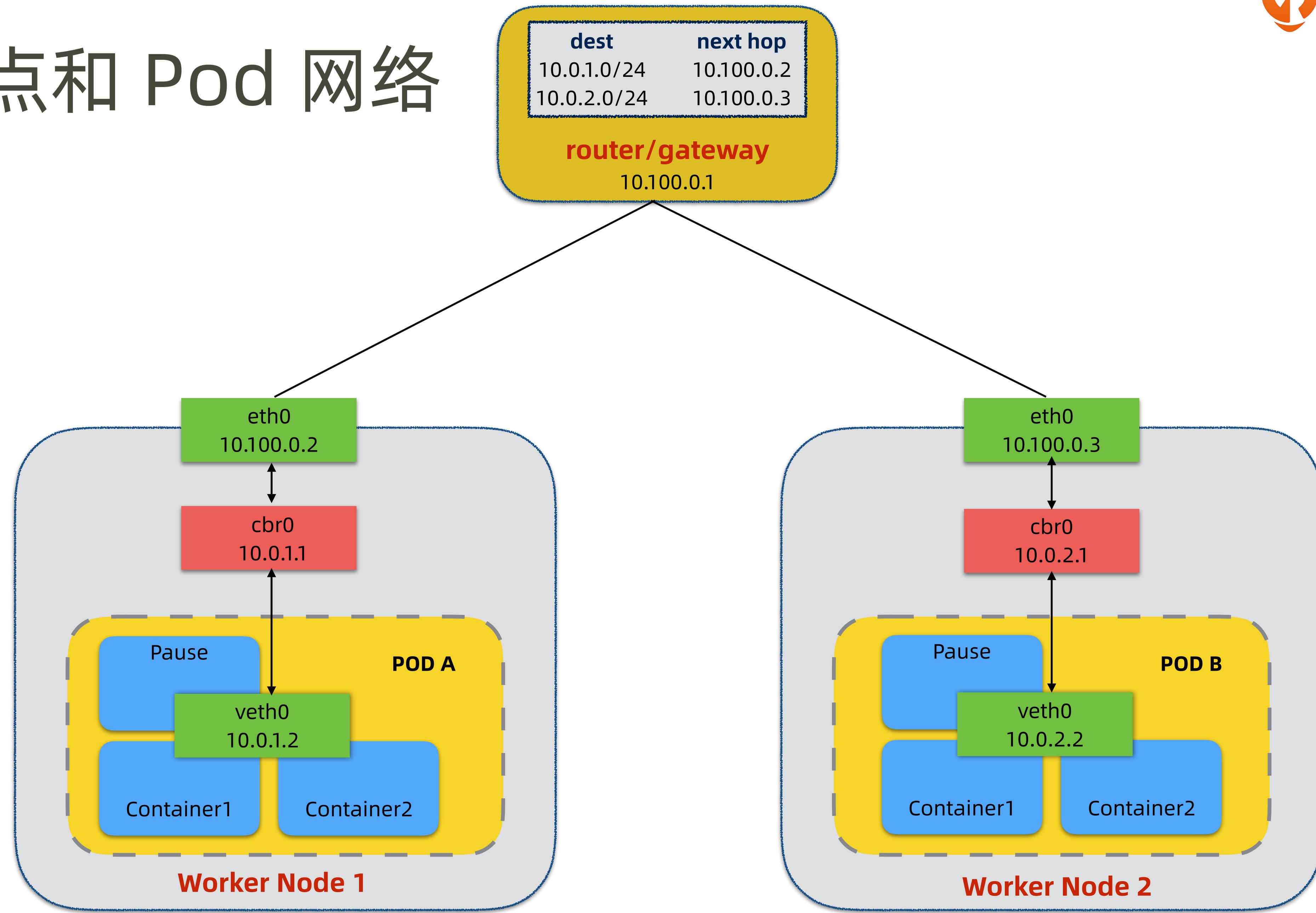
概念总结2

概念	作用
Job	运行一次就结束的任务
CronJob	周期性运行的任务
Volume	可装载磁盘文件存储
PersistentVolume/ PersistentVolumeClaims	超大磁盘存储抽象和分配机制
Label/Selector	资源打标签和定位机制
Namespace	资源逻辑隔离机制
Readiness Probe	就绪探针，流量接入 Pod 判断依据
Liveness Probe	存活探针，是否 kill Pod 的判断依据

第 4 部分

理解 Kubernetes 节点网络和 Pod 网络

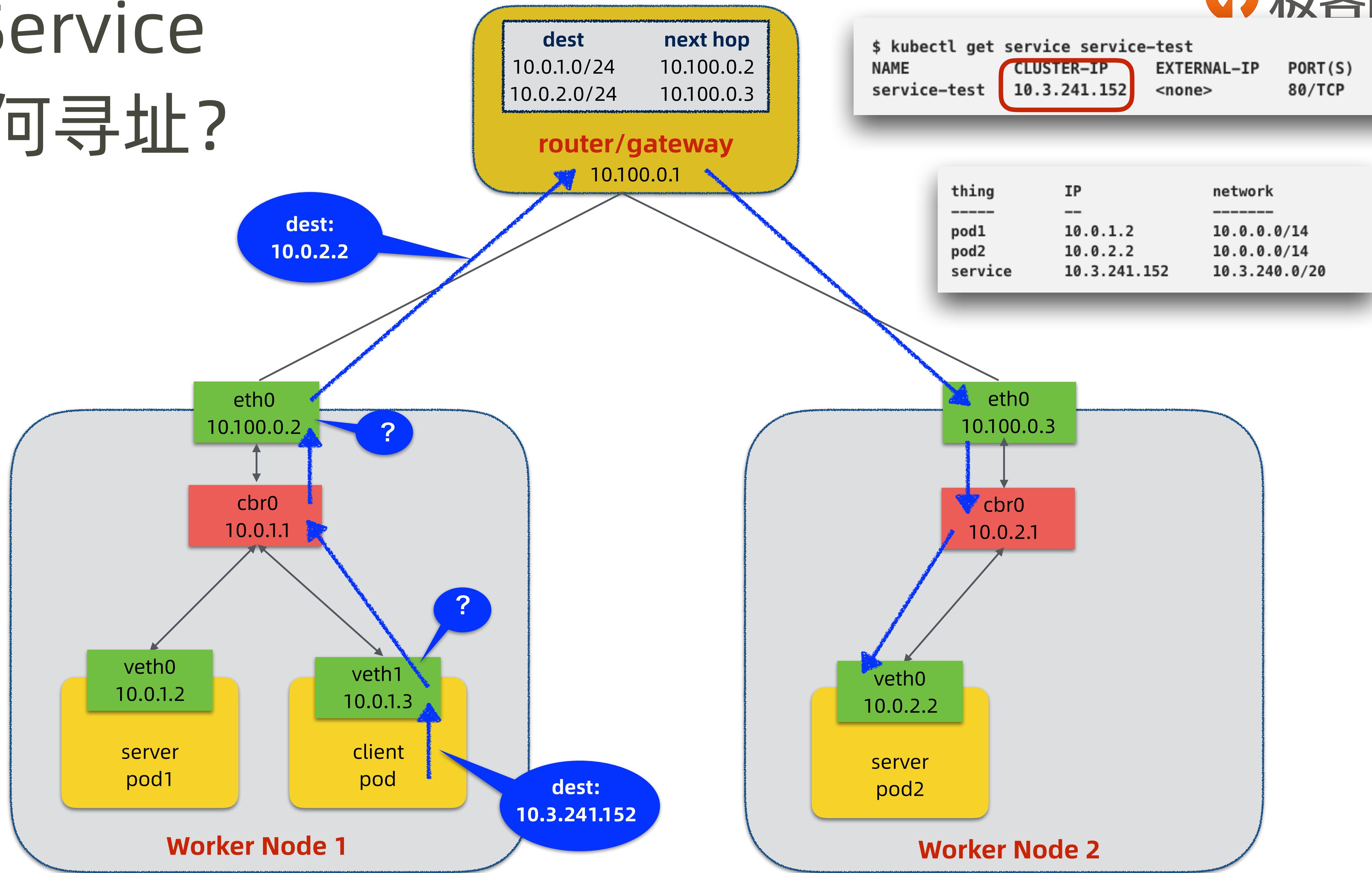
节点和 Pod 网络



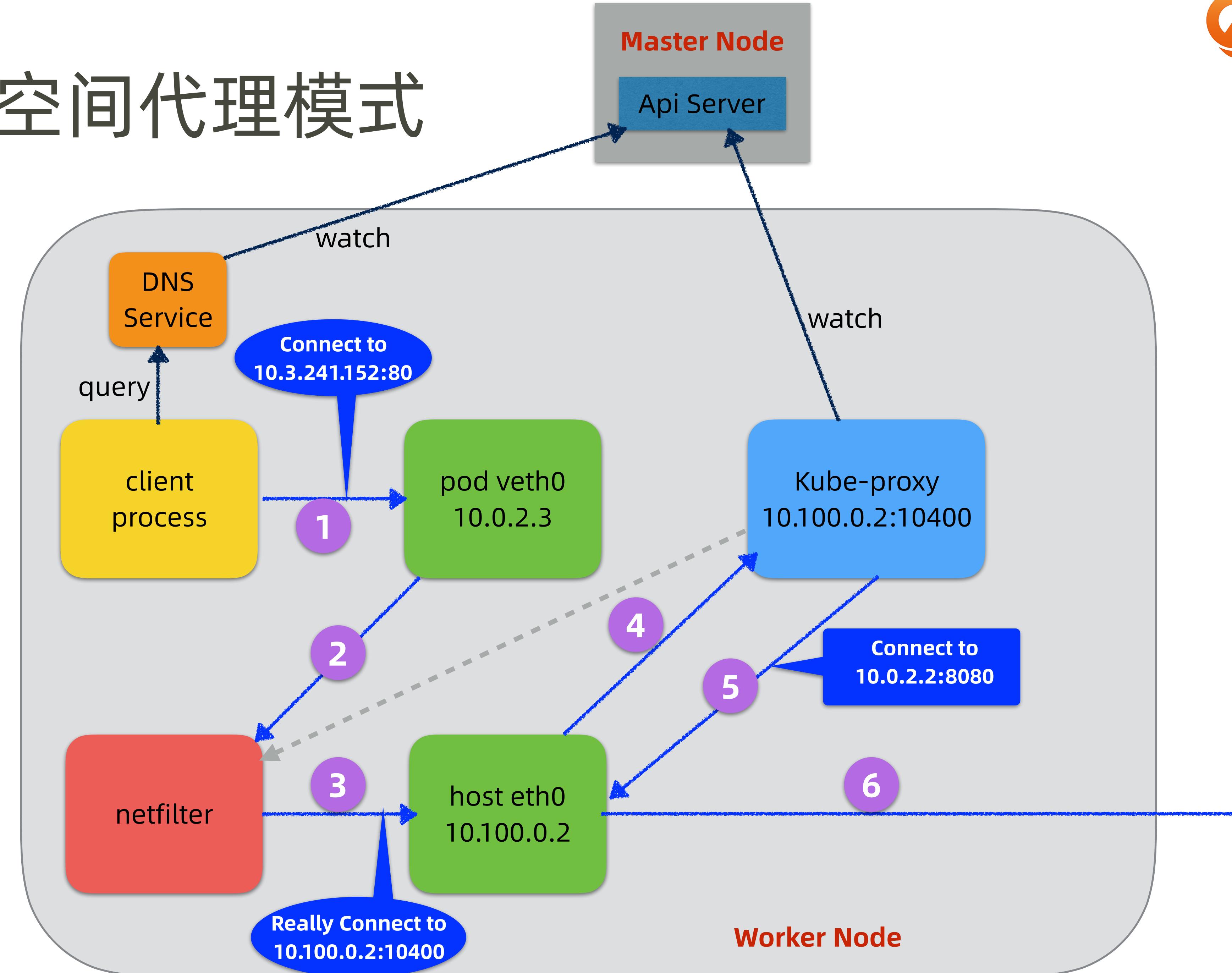
第 5 部分

深入理解 Service 和 Service Discovery

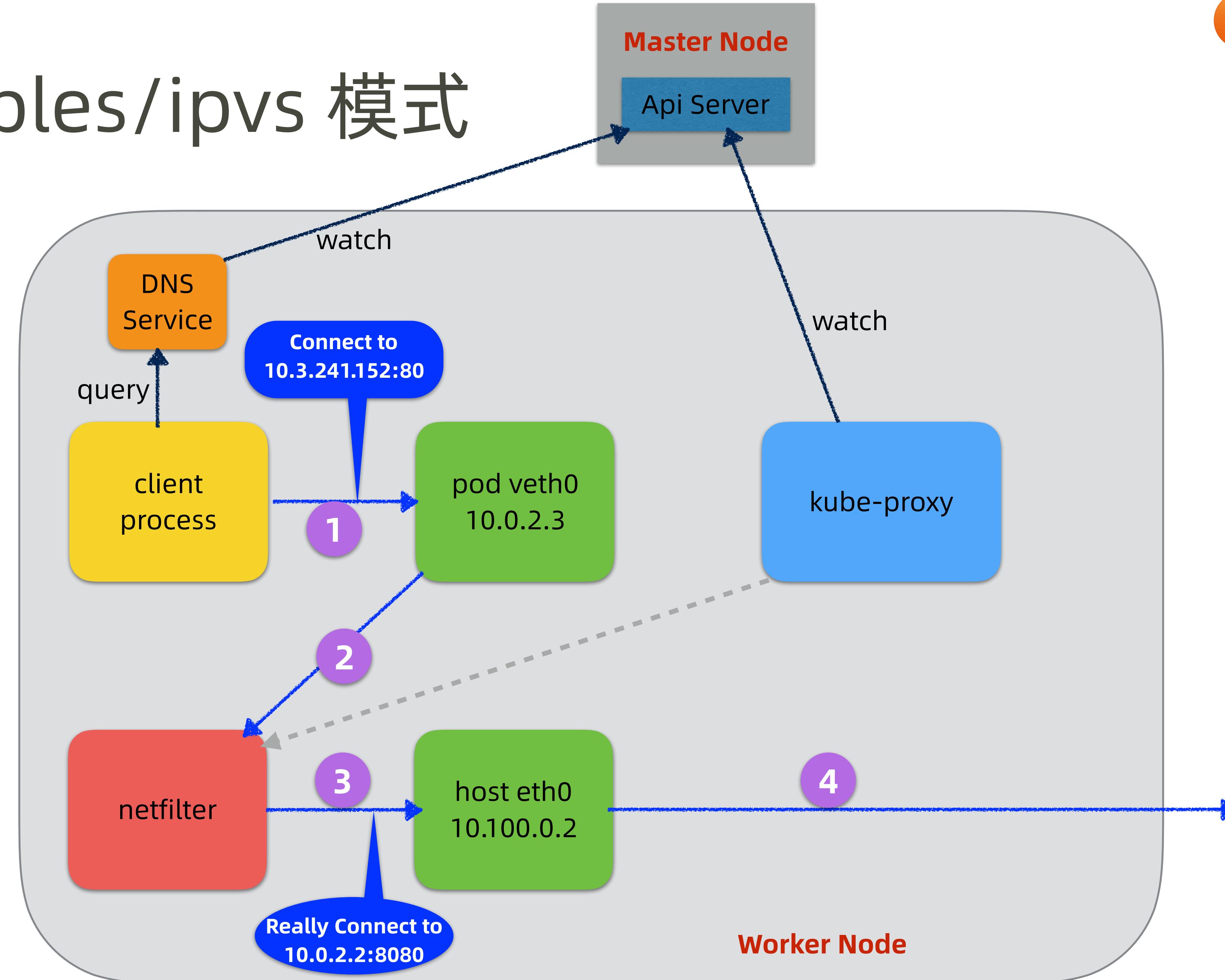
Service 如何寻址？



用户空间代理模式



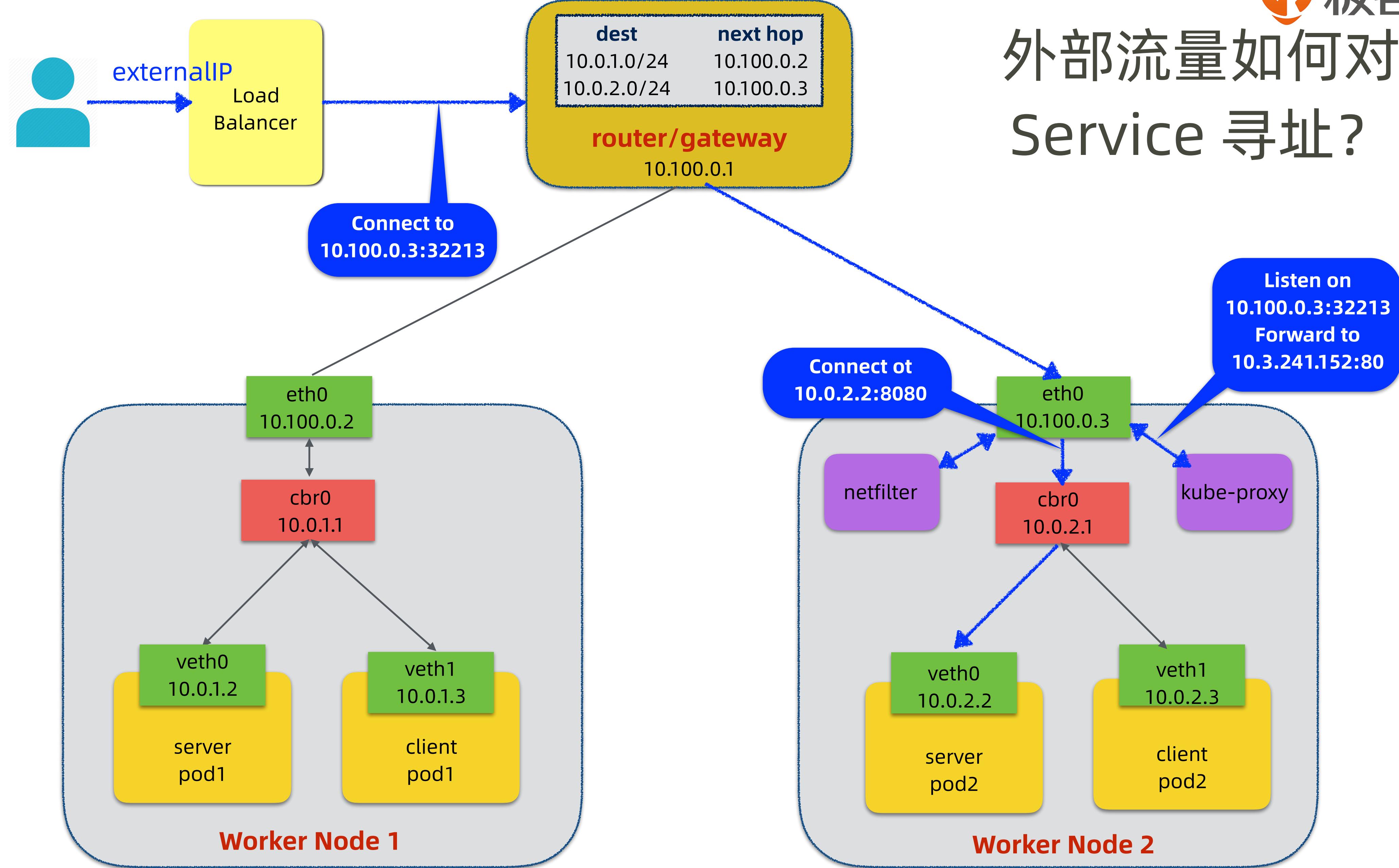
iptables/ipvs 模式



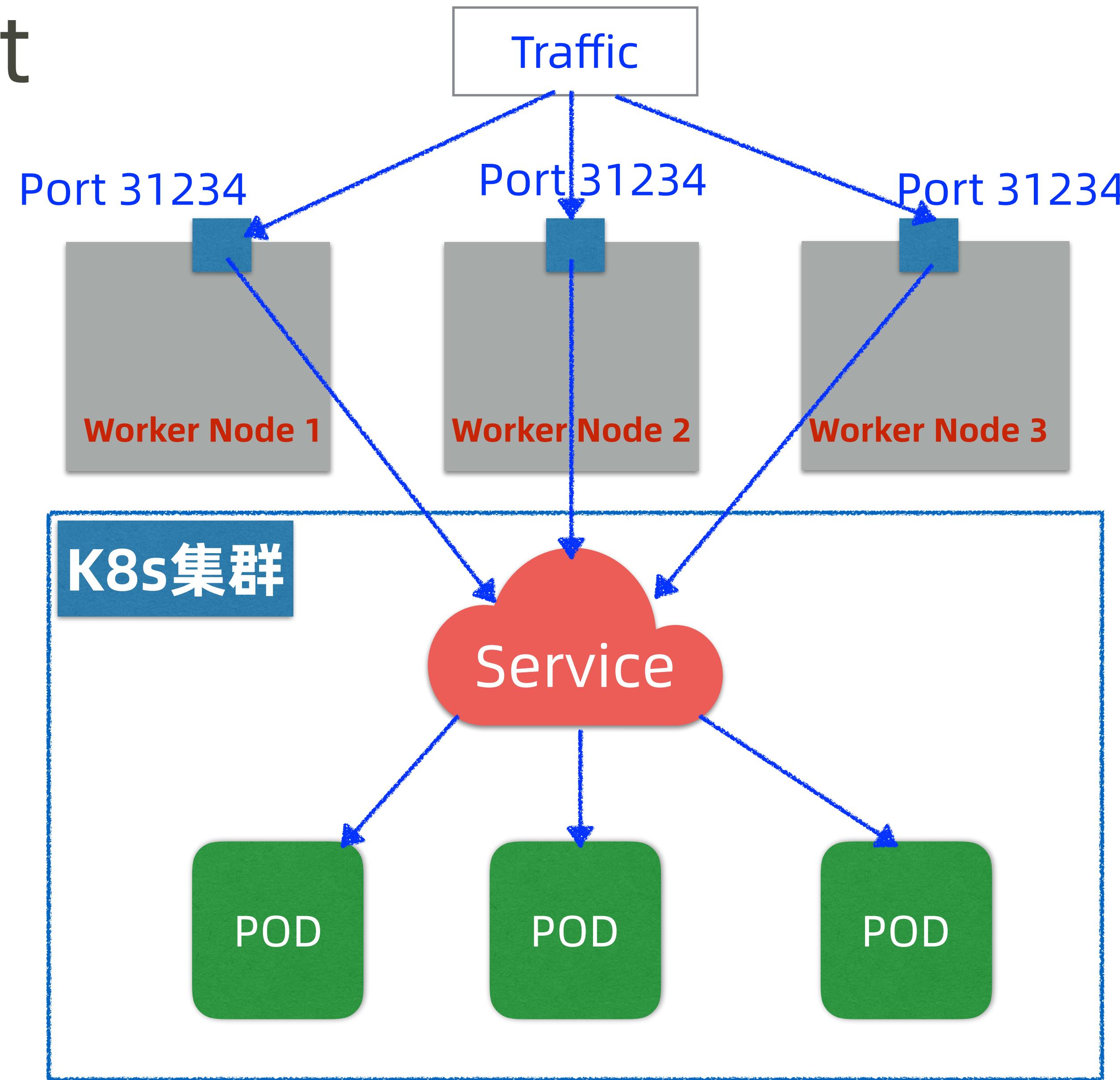
第 6 部分

NodePort vs LoadBalancer vs Ingress

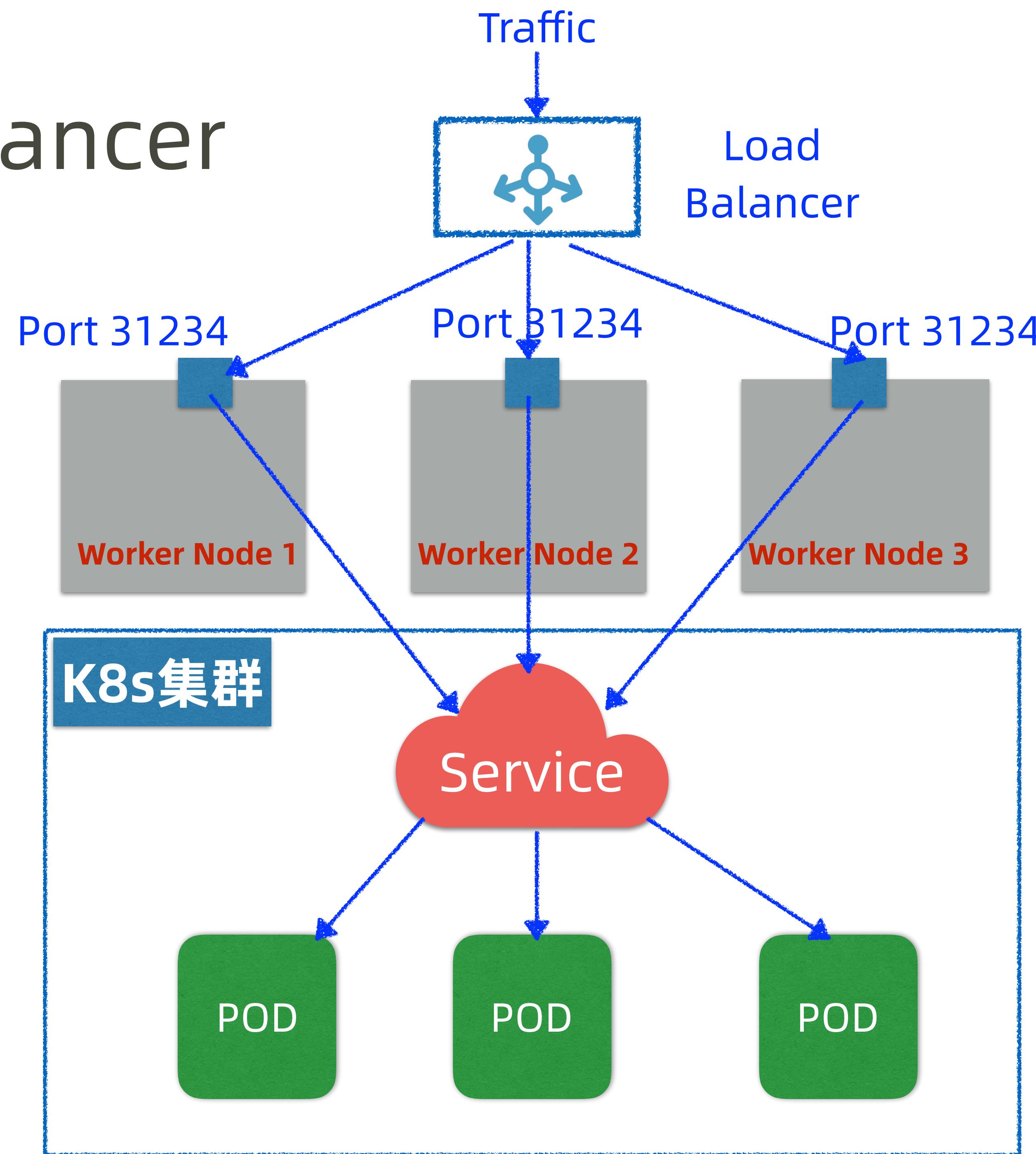
外部流量如何对 Service 寻址？



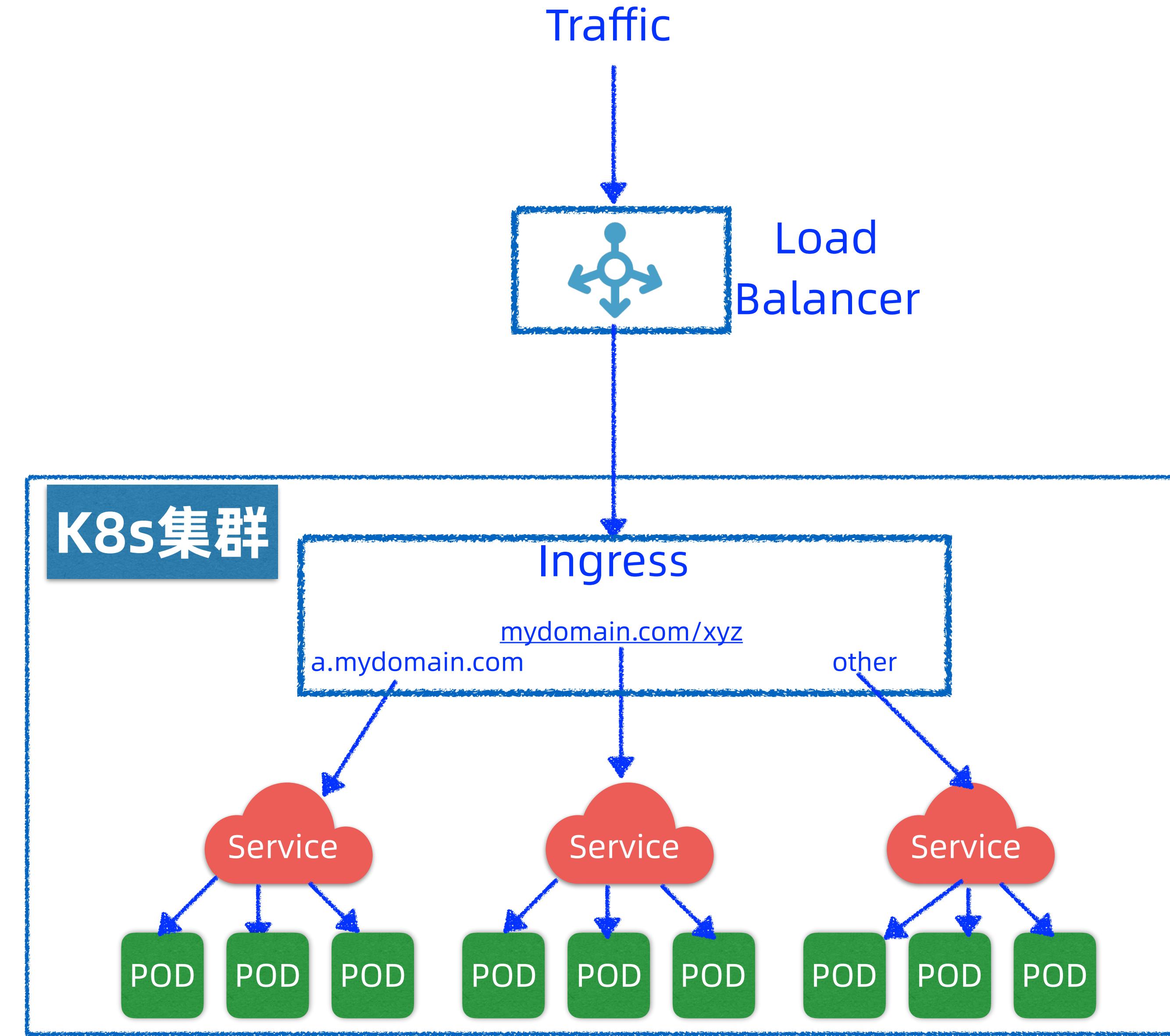
NodePort



Load Balancer

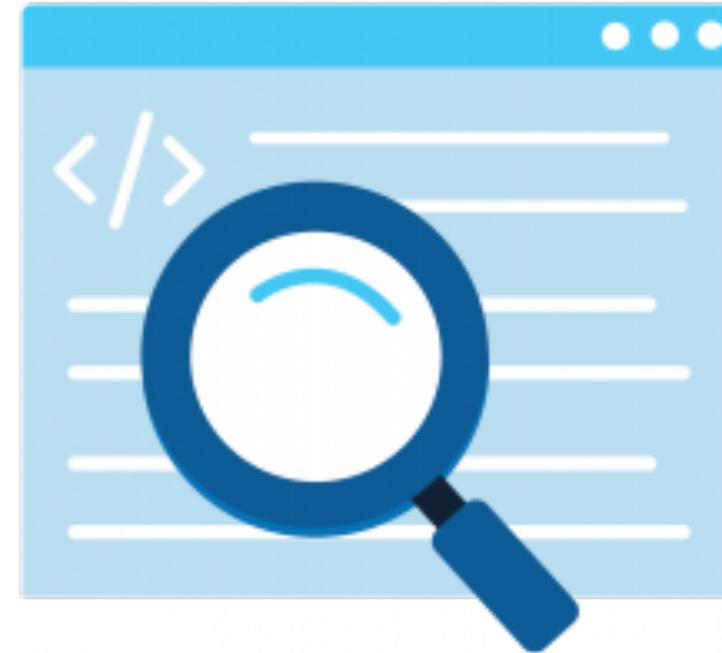


Ingress



总结

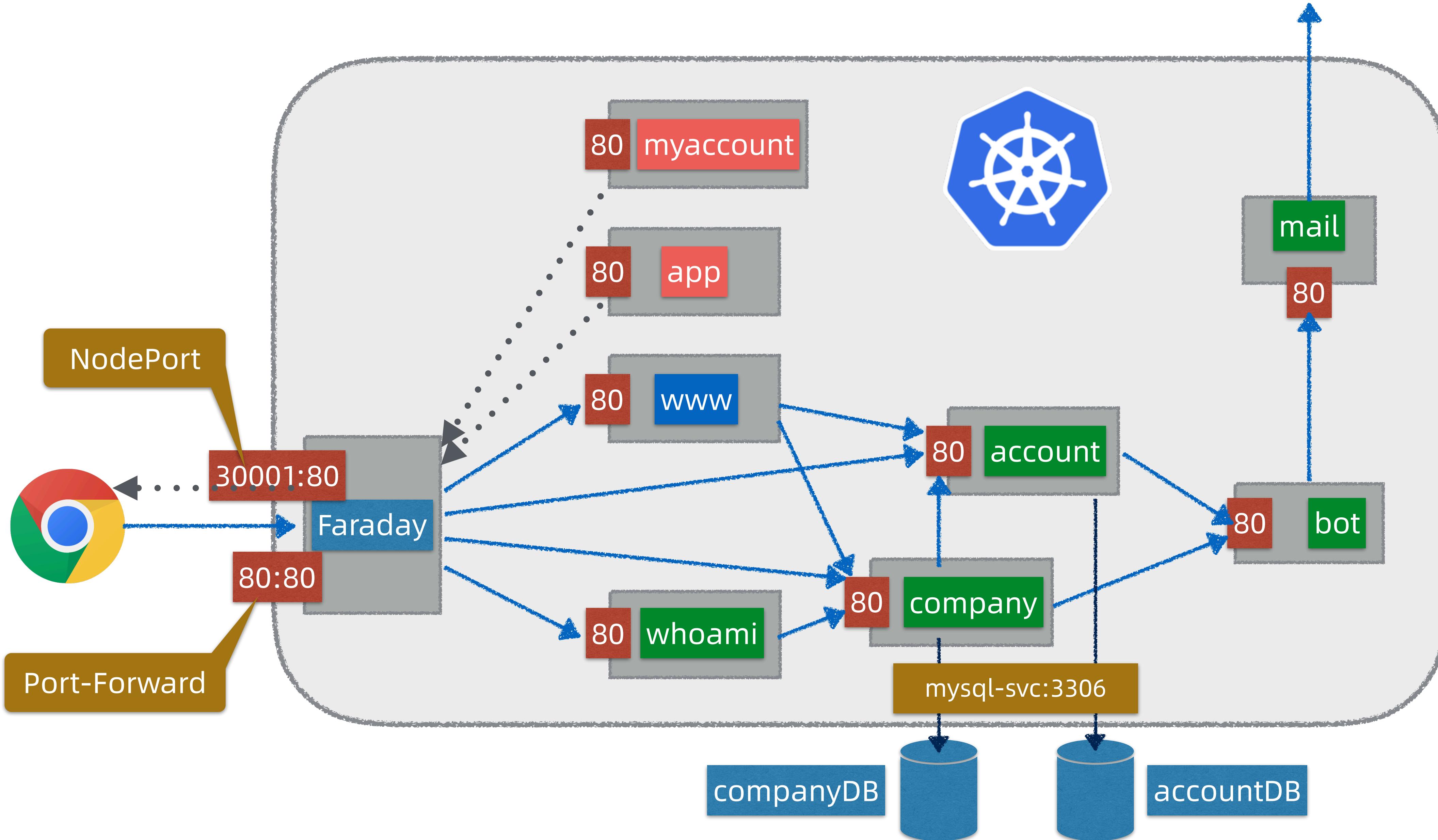
	作用	实现
节点网络	Master/Worker 节点之间网络互通	路由器, 交换机, 网卡
Pod 网络	Pod 之间互通	虚拟网卡, 虚拟网桥, 路由器
Service 网络	屏蔽 Pod 地址变化+负载均衡	Kube-proxy, Netfilter, Api-Server, DNS
NodePort	将 Service 暴露在节点网络上	Kube-proxy + Netfilter
LoadBalancer	将Service暴露在公网上+负载均衡	公有云 LB + NodePort
Ingress	反向路由, 安全, 日志监控 (类似反向代理 or 网关)	Nginx/Envoy/Traefik/Faraday

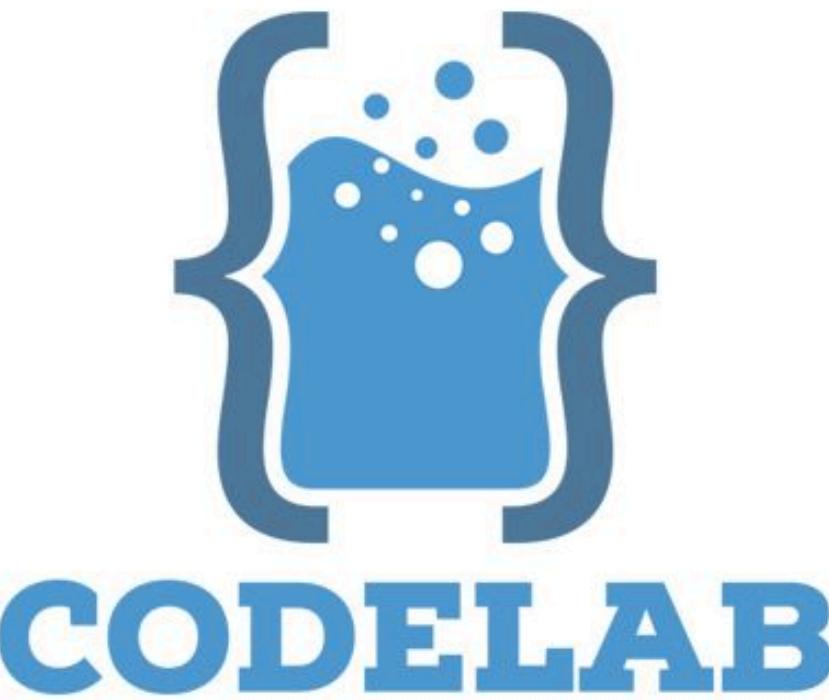


第 7 部分

本地测试 Kubernetes 部署文件剖析

本地 Kubernetes 部署架构

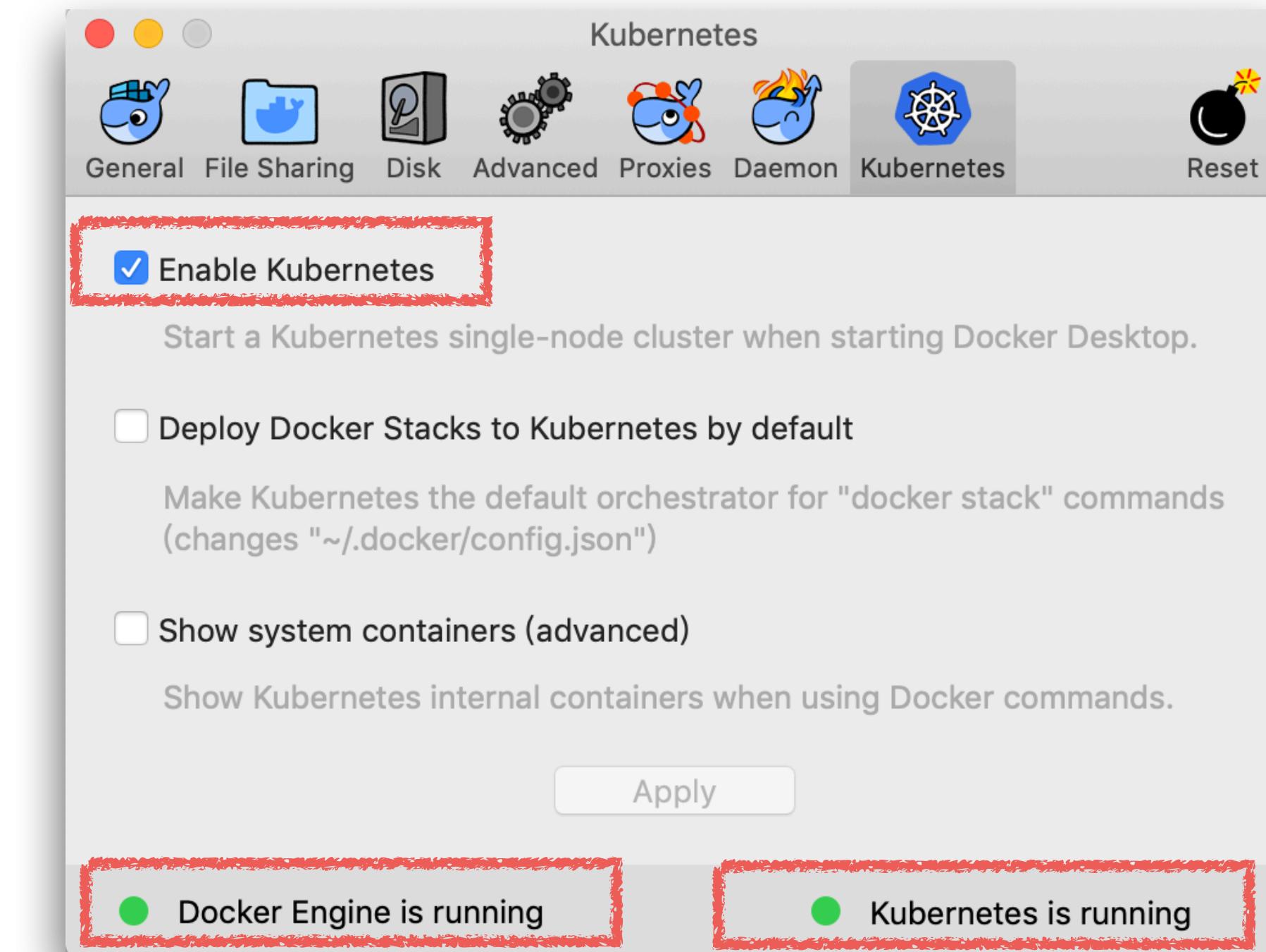
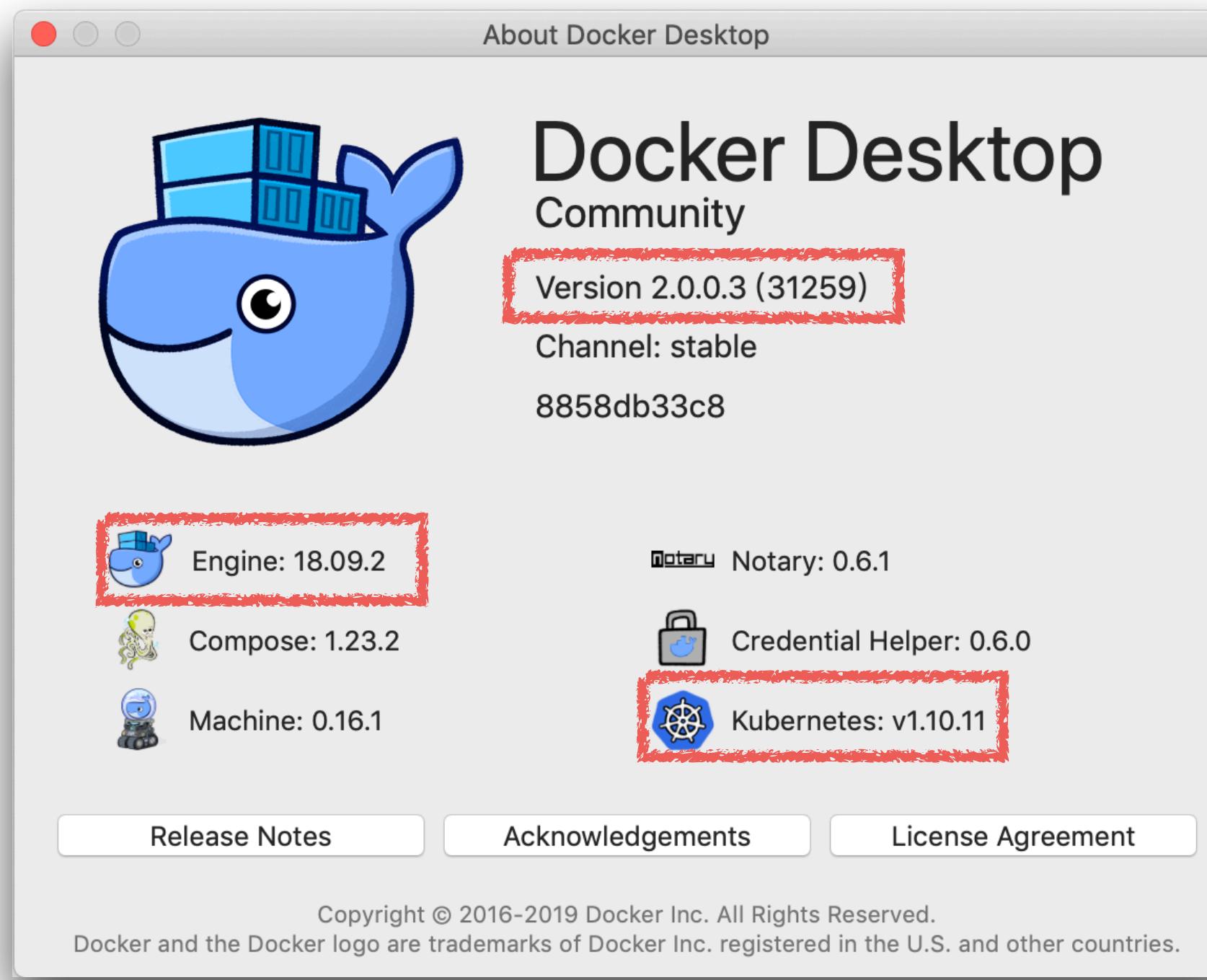




第 8 部分

本地测试 Kubernetes 环境搭建

Docker Desktop for Mac/Win



<https://docs.docker.com/docker-for-mac/install/>

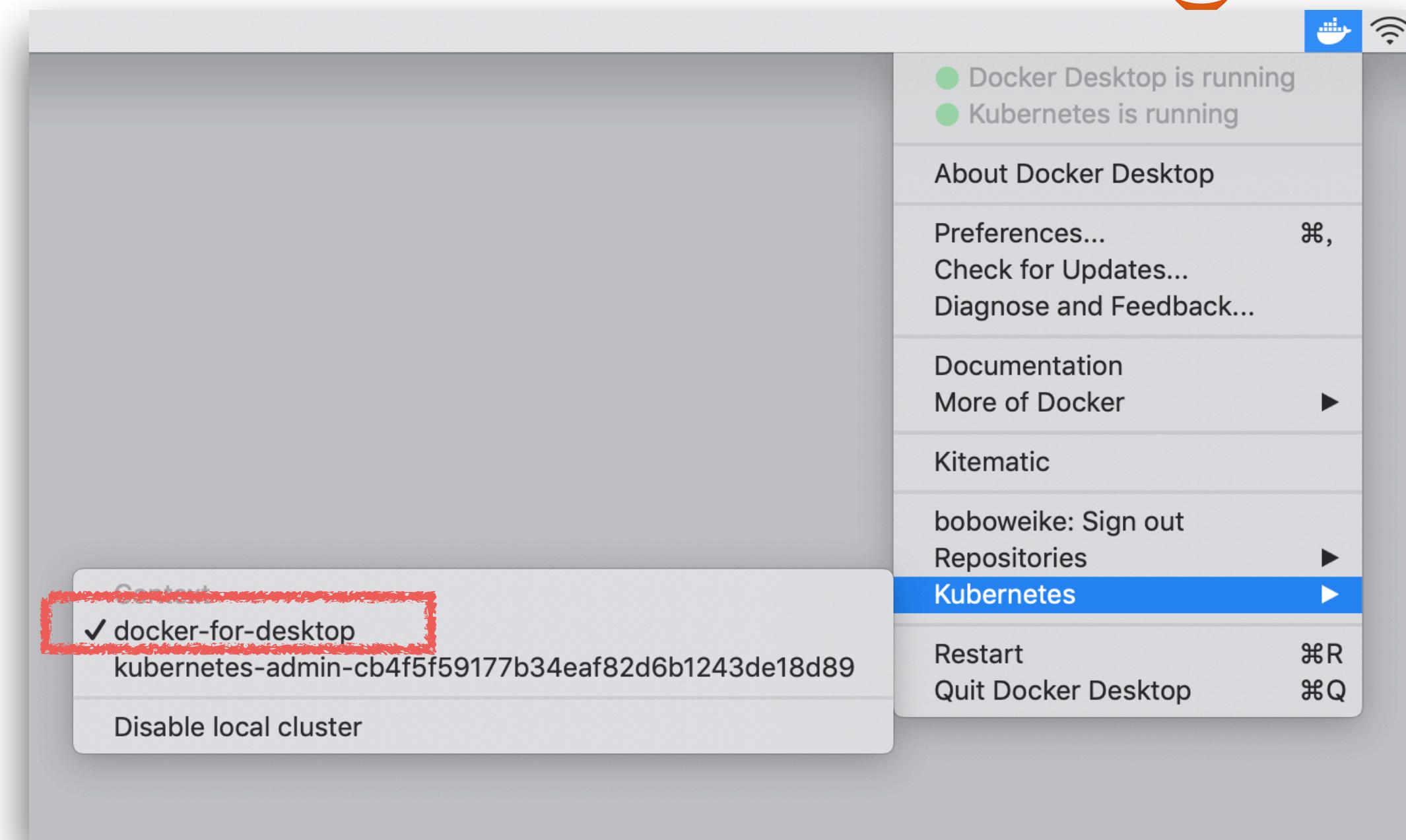
<https://docs.docker.com/docker-for-windows/install/>

<https://github.com/AliyunContainerService/k8s-for-docker-desktop>

<https://github.com/AliyunContainerService/minikube>

校验 Kubernetes 安装

1. kubectl version
2. kubectl config current-context
3. kubectl cluster-info
4. kubectl get nodes



安装和访问 Kubernetes Dashboard

1. 安装Kubernetes Dashboard

- <https://github.com/kubernetes/dashboard>
- kubectl get pods —namespace=kube-system

Step By Step

2. 启动 kube proxy

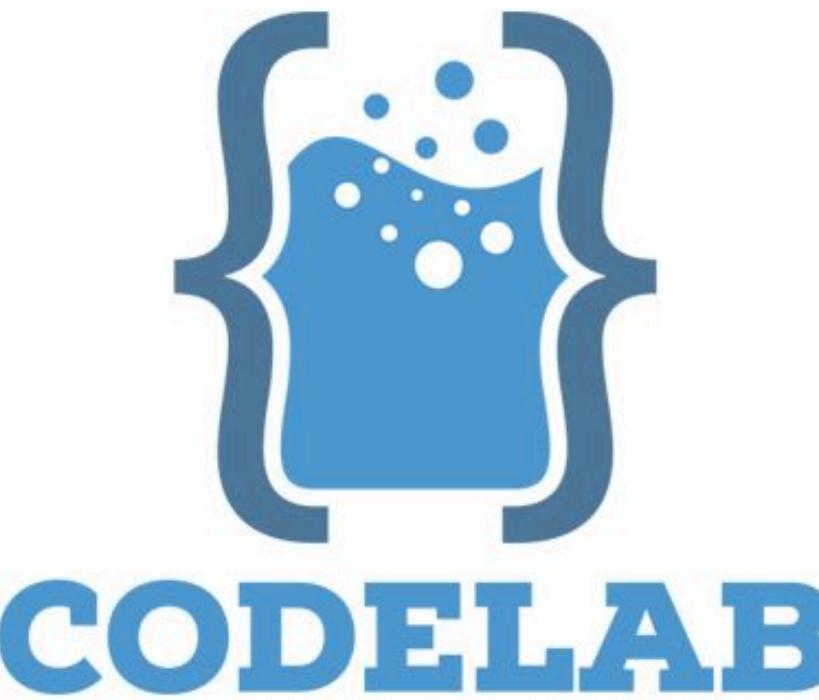
- kubectl proxy

3. 生成访问令牌

- kubectl -n kube-system describe secret \$(kubectl -n kube-system get secret | grep admin-user | awk '{print \$1}')

4. 访问 Dashboard

- http://localhost:8001/api/v1/namespaces/kube-system/services/https:kubernetes-dashboard:/proxy/



第 9 部分

将 Staffjoy 部署到本地 Kubernetes 环境

构建和部署

1. 镜像构建(可选)

- mvn clean package -DskipTests
- docker-compose build
- docker images

2. 部署mysql数据库(可选)

- staffjoy_account
- staffjoy_company
- 授予ip访问权限

3. 部署Staffjoy(k8s/test)

- kubectl apply -f config.yml
- kubectl apply -f test

4. 端口转发

- 查询faraday pod名 : Kubectl get pods
- kubectl port-forward faraday-svc-deployment-8584d9c74d-v92wt 80:80

5. 启用SwitchHosts

6. 命令行校验

- kubectl get pods -o wide
- Kubectl get services
- Kubectl get deployments

7. K8s Dashboard校验

8. Staffjoy校验

9. 清理

- kubectl delete deployments —all
- kubectl delete services —all
- kubectl delete configmaps —all

MySQL 访问权限

1. 登录 MySQL

- mysql -u root -p

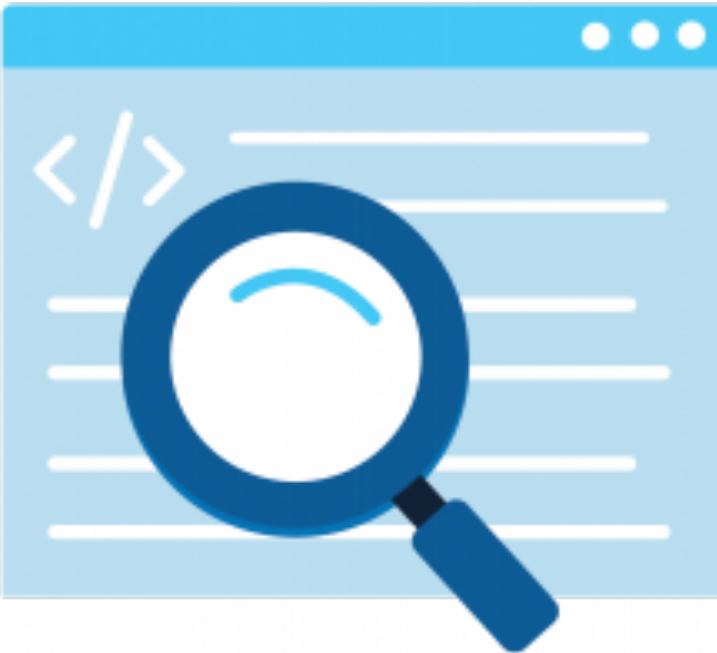
2. 查询 user 表

- use mysql;
- Select user, host from user;

3. 授权

- grant all privileges on *.* to root@*your_ip* identified by '*root_password*' with grant option;

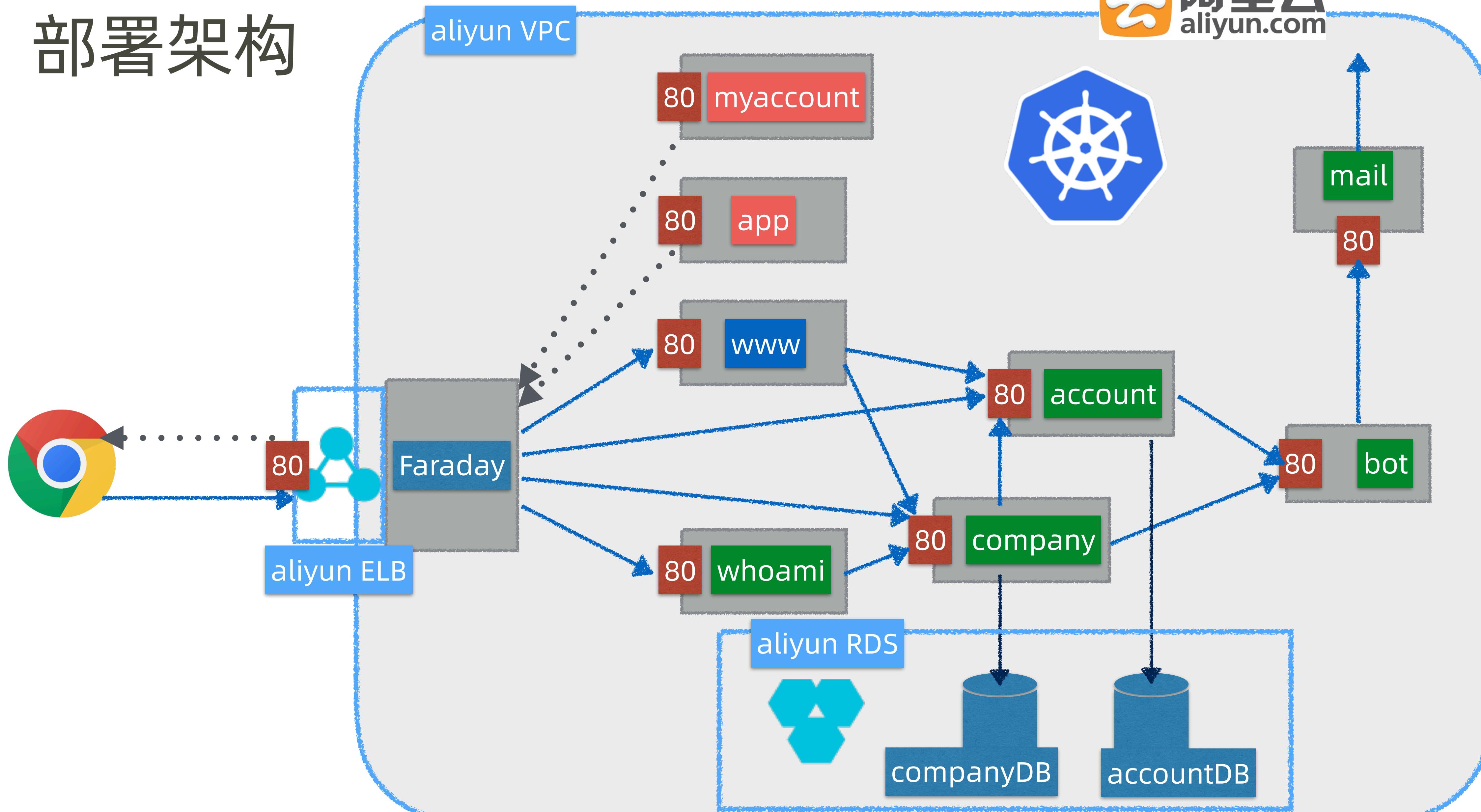
```
mysql> select user,host from user;
+-----+-----+
| user      | host       |
+-----+-----+
| root      | 192.168.1.100 |
| mysql.session | localhost |
| mysql.sys    | localhost |
| root      | localhost |
| springmall | localhost |
+-----+-----+
5 rows in set (0.00 sec)
```



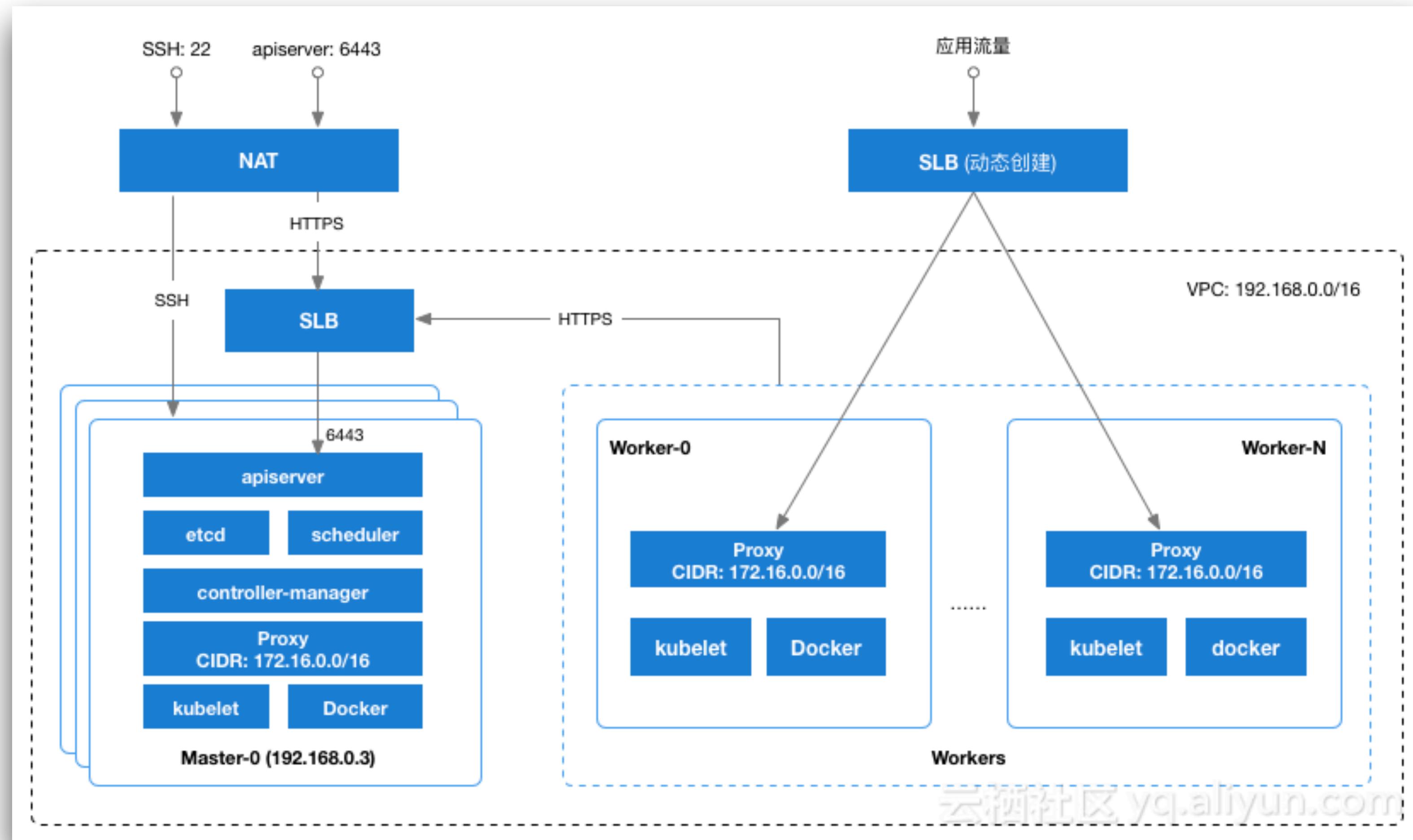
第 10 部分

生产环境 Kubernetes 部署文件剖析

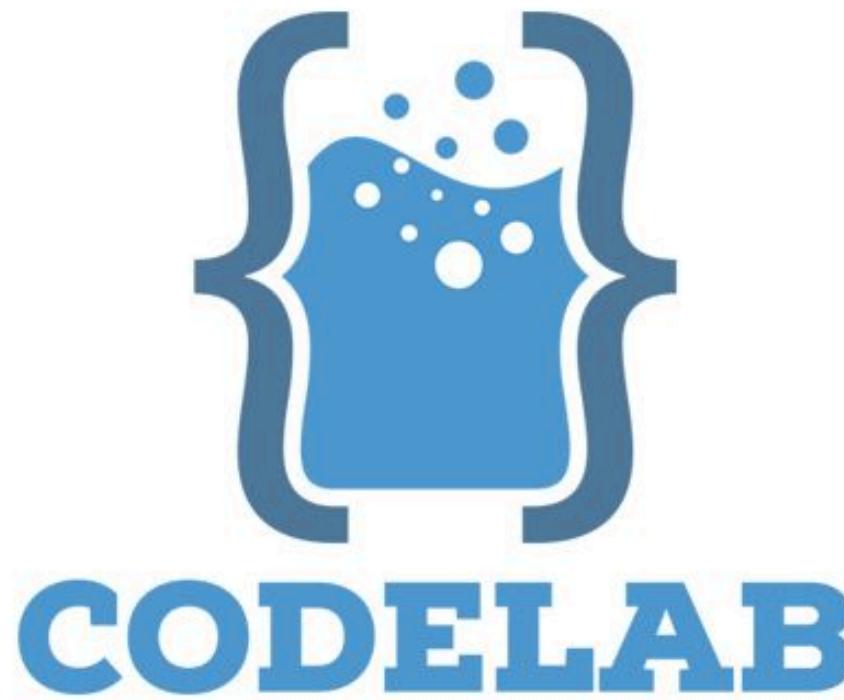
Staffjoy 阿里云 Kubernetes 部署架构



阿里云 Kubernetes 拓扑结构



<https://yq.aliyun.com/articles/88526>



第 11 部分

阿里云 Kubernetes 环境创建

Kubernetes 环境创建

1. 创建 VPC

2. 创建 RDS 数据库

- 加 IP 白名单
- 更新 JDBC 连接字符串
- 创建 root 账户
- 创建数据库和表

3. 创建共享版 Kubernetes 集群

- 更新 .kube/config

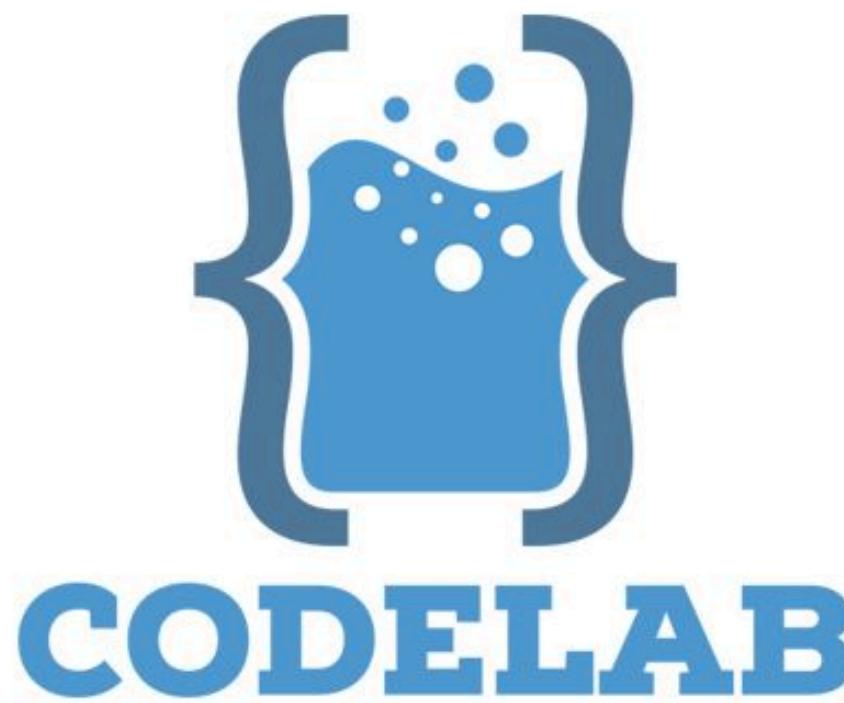
4. 校验

- kubectl config current-context
- kubectl cluster-info
- kubectl get nodes



Step By Step

A green diagonal banner with the text "Step By Step" in white, tilted at approximately a 45-degree angle from the bottom-left to the top-right.



第 12 部分

将 Staffjoy 部署到阿里云 Kubernetes 环境

Staffjoy 部署

1. 部署 Staffjoy(Kubernetes/UAT)

- kubectl apply -f config
- kubectl apply -f uat

2. 阿里云 Dashboard 校验

3. 命令行校验

- kubectl get pods -o wide
- Kubectl get services
- Kubectl get deployments

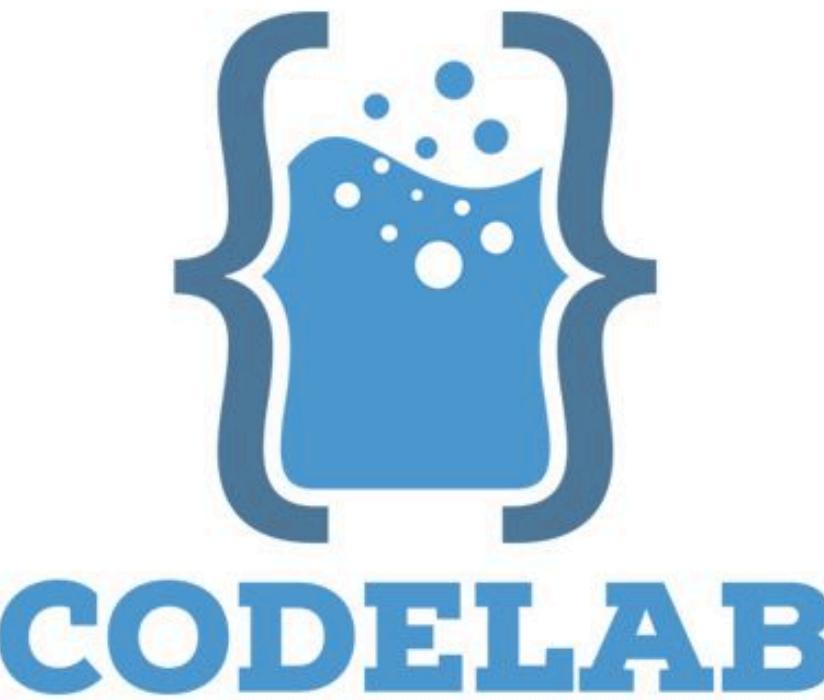
4. 启用 SwitchHosts

- 更新 ELB IP 地址

5. Staffjoy 校验

6. 删除阿里云 Kubernetes 和 RDS

Step By Step



第 13 部分

Kubernetes 应用动态配置实验

Staffjoy 动态配置实验步骤

1. Kubernetes Dashboard 校验

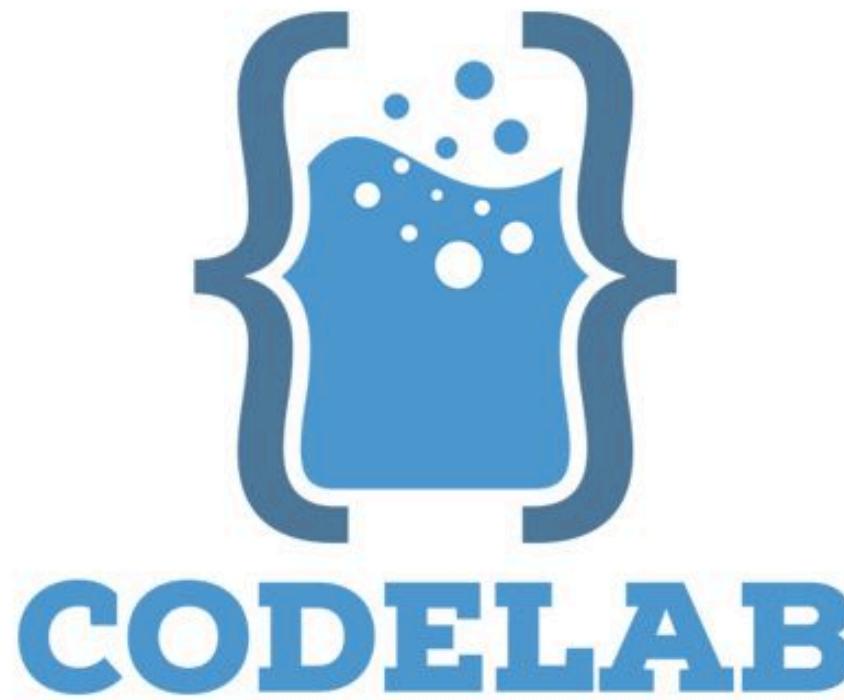
- account-svc pod 命令控制台校验 logback-config.yaml 文件内容

2. 更新 logback 配置 (Kubernetes/UAT/config)

- 更新 logback 为 debug 输出
- kubectl apply -f logback-config.yaml

3. Kubernetes Dashboard 校验

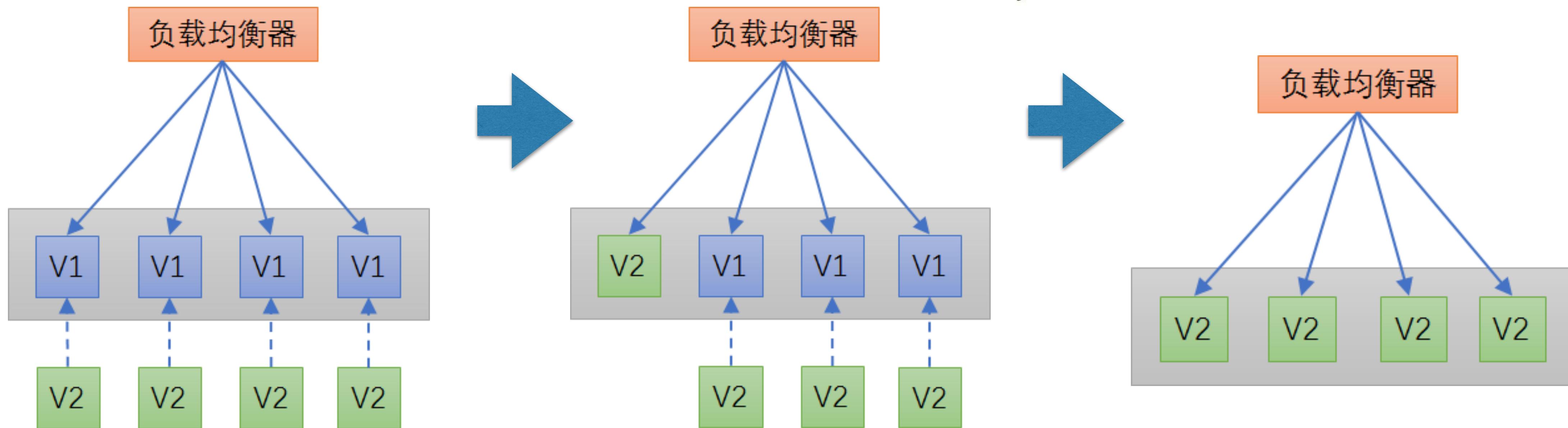
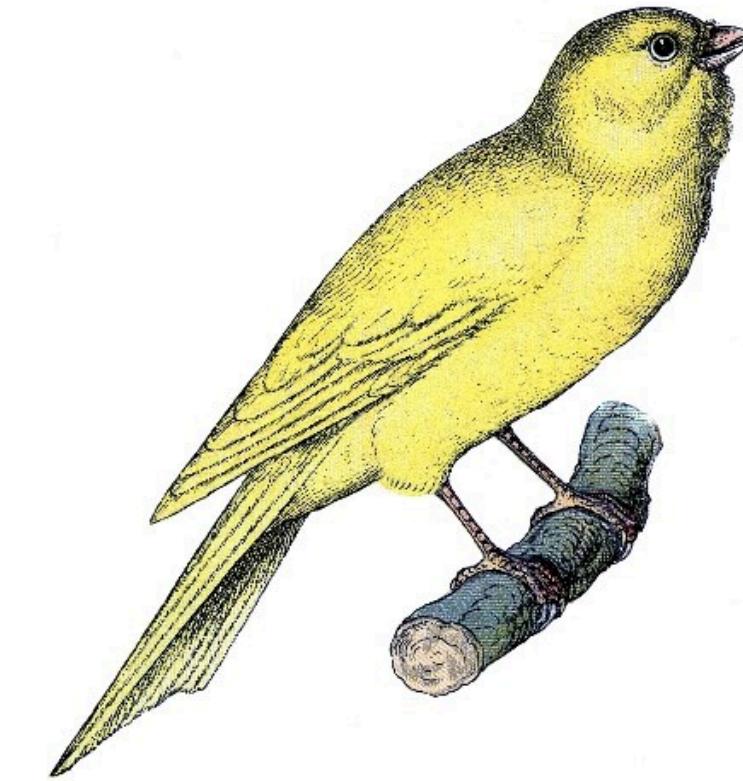
- account-svc pod 命令控制台校验 logback-config.yaml 文件更新
- 等待 30 秒
- account-svc pod 日志控制台输出 debug 日志



第 14 部分

Kubernetes 应用金丝雀发布实验

金丝雀发布



金丝雀发布步骤

1. www-web-deployment 扩容到 3 个实例
2. 发布金丝雀 www-web-deployment-canary
 - kubectl apply -f canary
3. 校验
4. 扩容金丝雀到 3 个实例
5. 删除 www-web-deployment



Step By Step



扫码试看/订阅

《Spring Boot & Kubernetes 云原生微服务实践》