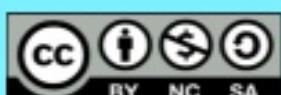


# Netkiller Virtualization 手札

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kubernetes



# Netkiller Container 手札

## 目录

### 自述

1. 写给读者
2. 作者简介
3. 如何获得文档
4. 打赏 (Donations)
5. 联系方式

### 1. Docker

#### 1. 安装 Docker

##### 1.1. Rocky Linux 9.0 / AlmiLinux 9.0 / CentOS 8 Stream

添加容器管理员

docker-compose 2.x

切换镜像

##### 1.2. Ubuntu docker-ce

##### 1.3. 测试 Docker

##### 1.4. 重置 Docker

##### 1.5. 早起版本

CentOS 7 docker-ce

CentOS 6

Ubuntu

### 2. Portainer - Docker 图形管理界面

#### 2.1. 安装

#### 2.2. 配置 Portainer

#### 2.3. 添加代理出错

### 3. 配置 Docker

#### 3.1. 开启远程访问

/etc/docker/daemon.json

配置SSL证书

通过 SSH 连接远程 Docker

### 3.2. 镜像配置

临时选择镜像

切换国内镜像

### 3.3. DNS

### 3.4. ulimit 资源

## 4. docker 命令

### 4.1. docker - A self-sufficient runtime for containers

连接远程主机

查看 docker 信息

run

查看 docker run 参数

-it

--restart 参数

--privileged 让 root 具备真正的 root 权限

设置环境变量

DNS

add-host

暴漏端口

内存资源分配

start / stop / restart

更新容器参数

ps

不截断输出，显示完整信息

格式化输出

kill 信号

top

inspect

获取容器名称

容器镜像名称

获取容器主机名 Hostname

查询 IP 地址

查询子网

容器日志

获取 json 配置

函数

综合查询  
查看 Mount 目录

镜像管理

查看镜像  
获取新镜像  
批量删除镜像  
删除 <none> 镜像  
批量删除镜像

logs

跟踪实时日志  
显示时间戳  
显示一段范围内的日志

重置 Docker

仓库操作  
    登陆  
    注销

build

网络管理  
事件信息  
从 docker 中复制文件

查看历史记录

安全漏洞扫描

Contexts

    查看  
    创建  
    inspect  
    使用 context  
    删除  
    --context 参数

4.2. docker-compose - Define and run multi-container applications with Docker.

安装 docker-compose

    使用 pip 安装  
    OSCM 安装

查看版本号

快速入门

启动  
停止  
    停止  
    启动  
查看进程  
查看日志  
执行命令  
运行

#### 4.3. Docker Scan

### 5. 镜像管理

- 5.1. 搜索镜像
- 5.2. 获取镜像
- 5.3. 列出本地镜像
- 5.4. tag
- 5.5. 保存和载入镜像
- 5.6. 删除本地镜像
- 5.7. history 镜像历史纪录
- 5.8. format 用法
- 5.9. inspect
- 5.10. 查看镜像内容

### 6. 容器管理

- 6.1. 查看容器
- 6.2. 启动与终止容器
- 6.3. 进入容器
- 6.4. 运行容器内的命令
- 6.5. 导出和导入容器
  - Ubuntu
  - Mac 导出与导入
- 6.6. 停止所有容器
  - 信号处理
- 6.7. 删除容器
- 6.8. log-driver
- 6.9. 操作系统
  - 设置环境变量
  - /etc/hosts 配置
  - sysctl

## ulimits

- 6.10. 查看容器内运行的进程
- 6.11. 更新容器资源配置
- 6.12. 查看容器的退出状态
- 6.13. 暂停与恢复容器
- 6.14. 对比容器的变化
- 6.15. 查看容器状态
- 6.16. 重启容器
- 6.17. DNS

## 7. 卷管理

- 7.1. 列出卷
- 7.2. 创建卷
- 7.3. 挂在镜像
- 7.4. 检查卷
- 7.5. 删除卷
- 7.6. 销毁所有未使用的卷
- 7.7. 在多个容器间共享卷
- 7.8. 容器绑定本地文件系统
- 7.9. 只读权限

## 8. Docker 网络管理

- 8.1. docker0 IP地址
- 8.2. 容器指定固定IP地址
- 8.3. 创建子网
- 8.4. 创建 overlay 网络
- 8.5. 网络命令空间
- 8.6. flannel 网络配置

## 9. 日志管理

- 9.1. 查看默认驱动
- 9.2. Fluentd 配置
- 9.3. Docker 配置
- 9.4. docker-compose 编排
- 9.5. 将日志输出到 /dev/stdout 和 /dev/stderr

## 10. Dockerfile

- 10.1. 基于 Dockerfile 创建镜像
  - 创建 Dockerfile 文件
  - 创建镜像

运行镜像

测试 Nginx

提交镜像

10.2. 基于 Alpine 制作镜像

10.3. Dockerfile 缺失的工具

Debian/Ubuntu 镜像

CentOS

alpine

10.4. Dockerfile 语法

COPY

EXPOSE

ENTRYPOINT

docker-entrypoint.sh 文件

## 11. 仓库

11.1. Docker 官方仓库

登陆仓库

获取镜像

上传镜像

11.2. 私有仓库

搭建私有仓库

推送镜像到私有仓库

查询镜像

registry 镜像高级配置

私有仓库认证

registry 接口

11.3. Harbor

## 12. Swarms

12.1. 管理 Swarms

查看 Swarms 版本

初始化 Swarms

显示 join-token

创建虚拟机

显示虚拟机列表

设置管理节点

环境变量

切换节点

启动/停止节点  
离线

## 12.2. Stack

## 12.3. 服务

创建 Service  
删除 Service  
inspect

## 12.4. swarm 卷管理

Host Volumes  
Named Volumes  
共享卷

# 13. docker-compose.yml 容器编排

## 13.1. 版本号

## 13.2. 镜像

## 13.3. 容器名称

## 13.4. 启动策略

## 13.5. 容器用户

## 13.6. 挂在卷

## 13.7. 映射端口的标签

## 13.8. 添加 hosts 文件

## 13.9. 网络配置

自定义 IPv4 子网地址

external 外部网络

配置 IPv6

## 13.10. links 主机别名

## 13.11. 链接外部容器

## 13.12. 服务依赖

## 13.13. working\_dir

## 13.14. 设置环境变量

## 13.15. 临时文件系统

## 13.16. 编译 Dockerfile

## 13.17. resources 硬件资源分配

# 14. Docker Example

## 14.1. registry

Auth + SSL

## 14.2. Example Java - Spring boot with Docker

- 获取 CentOS 7 镜像
- 安装 openjdk
- Spring boot 包
- 启动 Spring boot 项目
- 基于 CentOS 7 制作 spring 镜像

### 14.3. Redis

- Docker 命令

- 获取 Redis 镜像
- 启动一个 Redis 实例
- 进入 Redis
- 启动一个 Redis 实例并映射 6379 端口
- 维护容器

- Docker compose

- Docker Stack

- somaxconn/overcommit\_memory

### 14.4. Nginx

- nginx:latest

- 安装 Docker Nginx alpine

- 安装依赖工具

- 容器内优雅重启

### 14.5. MySQL

### 14.6. MongoDB

- 使用 mongodb 用户运行

## 14.7. Node

### 15. Docker FAQ

#### 15.1. 通过 IP 找容器

#### 15.2. 常用工具

- Debian/Ubuntu

#### 15.3. 检查 Docker 是否可用

#### 15.4. Bitnami

## 2. Podman

### 1. 安装 Podman

#### 1.1. RockyLinux 安装 Podman

#### 1.2. Almalinux 9.0

#### 1.3. MacOS 安装 Podman

- 1.4. 初始化 Podman
- 1.5. 让 Podman 支持 Docker Compose
- 1.6. 配置 Podman
- 1.7.
- 2. podman 管理
  - 2.1. 虚拟机管理
    - 管理 Podman 系统
  - 2.2. 镜像管理
    - 获取镜像
    - 查看镜像
  - 2.3. Registry
- 3. 按例
  - 3.1. podman run 用法
  - 3.2. mysql
  - 3.3. 制作镜像

## I. Kubernetes

- 3. Minikube
  - 1. CentOS 8 安装 minikube
    - 1.1. CentOS
      - 无虚拟机
    - 1.2. Mac OS
  - 2. Quickstart
  - 3. minikube 命令
    - 3.1. minikube ip 地址
    - 3.2. 启动 minikube
      - 虚拟机驱动
      - 开启GPU
      - 日志输出级别
      - CPU 和 内存分配
      - 指定 kubernetes 版本
      - 配置启动项
      - 指定 registry-mirror 镜像
      - 指定下载镜像
      - Enabling Unsafe Sysctls
      - 使用 CRI-O 容易
    - 3.3. 停止 minikube

- 3.4. Docker 环境变量
  - 3.5. SSH
  - 3.6. 缓存镜像
  - 3.7. 清理 minikube
  - 3.8. Kubernetes 控制面板
  - 3.9. service
  - 3.10. 查看日志
  - 3.11. 查看 Docker 环境变量
  - 3.12. profile
  - 3.13. addons
    - 查看所有插件
    - 启用 addons
    - 查看 addons 列表
    - dashboard
    - 开启 registry 私有库
    - 启用 ingress
  - 3.14. SSH
  - 3.15. 查看IP地址
  - 3.16. 镜像管理
  - 3.17. kubectl
- 4. Minikube 案例演示
  - 5. FAQ
    - 5.1. This computer doesn't have VT-X/AMD-v enabled. Enabling it in the BIOS is mandatory
    - 5.2. ERROR FileContent--proc-sys-net-bridge-bridge-nf-call-iptables
    - 5.3. ERROR ImagePull
    - 5.4. 证书已存在错误
    - 5.5. http: server gave HTTP response to HTTPS client
    - 5.6. provided port is not in the valid range. The range of valid ports is 30000-32767
    - 5.7. Exiting due to MK\_ENABLE: run callbacks: running callbacks: [verifying registry addon pods : timed out waiting for the condition: timed out waiting for the condition]

5.8. Exiting due to SVC\_URL\_TIMEOUT:

http://127.0.0.1:11068/api/v1/namespaces/kubernetes-dashboard/services/http:kubernetes-dashboard:/proxy/ is not accessible: Temporary Error: unexpected response code: 503

5.9. Mac minikube ip 不通, ingress 不工作

#### 4. microk8s

##### 1. 安装 microk8s

1.1. 安装指定版本

##### 2. 组件管理

2.1. dns

2.2. dashboard

##### 3. kubectl

##### 4. Kubernetes Addons

4.1.

#### 5. Kubernetes 集群管理

##### 1. 配置

1.1. KUBECONFIG

1.2. use-context

##### 2. 如何从 docker 过渡到 kubectl 命令

##### 3. 查看信息

3.1. api-versions

3.2. 节点

nodes

3.3. 查询集群状态

3.4. config

use-context

3.5. cluster-info

##### 4. namespace 命名空间

4.1. 查看命名空间

4.2. 创建命名空间

4.3. 使用 yaml 创建命名空间

4.4. 删除命名空间

##### 5. label 标签

##### 6. 服务管理

6.1. 列出服务

- 6.2. 创建服务
  - 6.3. 查看服务详细信息
    - 查看服务
  - 6.4. 更新服务
  - 6.5. 删除服务
  - 6.6. clusterip
    - selector
  - 6.7. 设置外部IP
  - 6.8. externalname
    - 绑定外部域名
  - 6.9. loadbalancer
    - LoadBalancer YAML
  - 6.10. nodeport
    - NodePort YAML
  - 6.11. Example
- 7. serviceaccount
  - 8. 部署管理
    - 8.1. Pod 管理
      - 查看 POD 状态
      - 格式化输出
      - 查看 pod 下面容器
    - 运行 POD
    - 删除 pod
    - 查看 Pod 的事件
    - Taint (污点) 和 Toleration (容忍)
      - Taint (污点) 设置
      - Toleration (容忍) 调度
    - 使用场景
  - Pod
    - 容器编排
      - 镜像拉取策略
    - 指定主机名
    - 环境变量
    - 健康状态检查
    - securityContext
    - sysctls

- runAsUser  
        security.alpha.kubernetes.io/sysctls
  - nodeName 选择节点
  - nodeSelector 选择节点
  - nodeAffinity 选择节点
  - Taint (污点) 和 Toleration (容忍)
  - strategy
- 8.2. expose
  - 8.3.
  - 8.4. 删除 deployment
  - 8.5. 资源管理
  - 8.6. rollout
9. 查看 pod 日志
  10. endpoints
  11. 执行 Shell
  12. edit
  13. port-forward 端口映射
  14. secret 密钥管理
    - 14.1. 获取 Token
    - 14.2. 创建 Secret
    - 14.3. Private Registry 用户认证
    - 14.4. 配置 TLS SSL
  15. ConfigMap
    - 15.1. 创建 Key-Value 配置项
    - 15.2. 从文件创建 ConfigMap
    - 15.3. 从环境变量文件创建 ConfigMap
    - 15.4. 查看 ConfigMap
    - 15.5. 删除 ConfigMap
    - 15.6. ConfigMap
      - Key-Value 配置
      - Secret
      - 环境变量
      - 配置文件
  16. Job/CronJob
    - 16.1. CronJob
    - 16.2. Job

## 执行单词任务 计划任务

- 17. explain
  - 17.1. ingress
- 18. 操作系统资源配置
  - 18.1. sysctls
- 19. 端口转发
- 20. 更新镜像
- 21. 复制文件
- 22. describe
  - 22.1. storageclasses.storage.k8s.io
  - 22.2. pod
- 23. clusterrolebinding
- 24. Volume
  - 24.1. local
- 案例
- 25. Ingress
  - 25.1. 端口
  - 25.2. URI 规则
  - 25.3. vhost 虚拟主机
  - 25.4. rewrite
  - 25.5. annotations 配置
    - HTTP 跳转到 HTTPS
    - server-snippet
  - 25.6. 金丝雀发布 (灰度发布)
    - 准备服务
    - 方案一，权重分配
    - 通过HTTP头开启灰度发布
    - 通过 Cookie 开启
  - 25.7. 管理 Ingress
- 6. kubectl example
  - 1. 私有 registry
  - 2. mongodb
  - 3. tomcat
- 7. istio
  - 1. 启动 istio

- 2. 禁用 istio
- 8. Kubeapps
- 9. Helm - The package manager for Kubernetes
  - 1. 安装 Helm
    - 1.1. AlmaLinux
    - 1.2. Rocky Linux
    - 1.3. Ubuntu
    - 1.4. Mac
  - 2. 快速开始
  - 3. Helm 命令
    - 3.1. 初始化 Helm
    - 3.2. 查看仓库列表
    - 3.3. 搜索
    - 3.4. 查看包信息
    - 3.5. 安装
    - 3.6. 列表
    - 3.7. 删除
    - 3.8. 升级
    - 3.9. 回滚
    - 3.10. 查看状态
  - 4. ingress-nginx
  - 5. elastic
  - 6. Helm The package manager for Kubernetes
  - 7. Helm Faq
- 10. Rancher - Multi-Cluster Kubernetes Management
  - 1. 安装 Rancher
    - 1.1. Rancher Server
      - Docker 安装
      - 防火墙配置
      - Helm 安装 Rancher
      - Mac 安装
      - 进入容器
      - Web UI
      - SSL 证书
    - 1.2. Rancher Kubernetes Engine (RKE) 2 Server

## Linux Agent (Worker)

### 1.3. Rancher Kubernetes Engine (RKE) 1

安装 RKE

v1.3.2

v0.1.17

配置 RKE

启动 RKE

### 1.4. Rancher CLI

二进制安装

### 1.5. rancher-compose

v0.12.5

## 2. 快速入门

### 2.1. API

## 3. Rancher Compose

### 3.1. Rancher Compose 命令

### 3.2. 操作演示

## 4. Rancher CLI

### 4.1. 登陆 Rancher

### 4.2. 查看集群

### 4.3. 查看节点

### 4.4. catalog

### 4.5. 查看设置

### 4.6. rancher kubectl

## 5. K3s

### 5.1. AutoK3s

命令行创建集群

私有镜像库

暴漏 80/443

扩展本地存储

Agent 代理安装

### 5.2. 安装 K3s (Docker 模式)

Server

Agent

安装 kube-explorer

### 5.3. 安装 K3s (VM 模式)

Server 服务安装

## Agent 代理安装

### 5.4. k3d

安装 k3d

创建集群

查看信息

删除集群

演示

部署 nginx

配置文件

导出集群配置文件

镜像管理

管理 k3d 集群

配置 api-port 端口

kubectl 管理指定集群

容器镜像库

traefik 配置

增加 Redis 6379 端口

ingress-nginx

卸载 traefik

安装 ingress-nginx

验证安装是否正确

### 5.5. TLS 证书

### 5.6. 创建 Token

### 5.7. FAQ

ghcr.io 镜像下载问题

k3s 80/443 端口问题

flannel 不通

Failed to allocate directory watch: Too many  
open files

## 6. Rancher Demo

### 6.1. Rancher 部署 Nginx

### 6.2. local-path-provisioner

## 7. Longhorn

### 7.1. 安装 Longhorn

### 7.2. 选择磁盘类型

### 7.3. 节点选择

### 7.4. FAQ

FailedAttachVolume

## 8. FAQ

8.1. 调试 Rancher 查看日志

8.2. [network] Host [rancher.netkiller.cn] is not able to connect to the following ports:  
[rancher.netkiller.cn:2379]. Please check network policies and firewall rules

8.3. cgroups v2

## 11. netkiller 容器编排工具

1. 安装 netkiller-devops

2. 使用 python 优雅地编排 Docker 容器

2.1. 安装依赖库

2.2. 创建一个 Services

2.3. 创建 Composes

2.4. 容器管理

2.5. 演示例子

Redis 主从配置

2.6. 使用 Python 编排 Dockerfile

2.7.

2.8. logstash

3. 使用 Python 优雅地编排 Kubernetes

3.1. 快速演示编排Nginx

3.2. 创建命名空间

3.3. ConfigMap/Secret 编排演示

3.4. Pod 挂载 ConfigMap 编排演示

3.5. Pod 挂载 ConfigMap 设置环境变量

3.6. Ingress 挂载 SSL 证书

3.7. StatefulSet 部署 Redis

3.8. StorageClass

3.9. 部署 MySQL 到 kubernetes

3.10. MongoDB

3.11. Nacos

单节点部署

集群部署

## Ingress 部署

### 3.12. Redis

### 3.13. Kubernetes 部署 kube-explorer 图形化界面

### 3.14. ELK

Elasticsearch

Kibana

验证是否工作正常

### 3.15. sonarqube

## 12. Virtual Machine(虚拟机)

### 1. Kernel-based Virtual Machine(KVM)

#### 1.1. kvm install usage yum

brctl / tunctl

virt-install

#### 1.2. Ubuntu

#### 1.3. CentOS 6.2

#### 1.4. Scientific Linux Virtualization

#### 1.5. libvirt

virsh

console

dumpxml

Virtual Machine Manager

#### 1.6. FAQ

No hypervisor options were found for this connection

如何判断当前服务器是实体机还是虚拟机

### 2. Xen

#### 2.1. install

#### 2.2. Manager

### 3. OpenVZ

#### 3.1. 安装OpenVZ

#### 3.2. 使用OpenVZ & 建立VPS

安装操作系统模板

创建OpenVZ操作系统节点 (VPS)

#### 3.3. 设置VPS参数

### 4. vagrant - Tool for building and distributing virtualized development environments

4.1. vagrant for windows

## 5. 虚拟机管理

5.1. Proxmox - Open-source virtualization management platform Proxmox VE

5.2. OpenStack

5.3. CloudStack

5.4. OpenNode

5.5. OpenNEbula

## 范例清单

3.1. minikube 操作演示

11.1. Redis Master/Slave

12.1. virsh

# Netkiller Container 手札

Virtualization、Docker、Kubernetes、KVM、Vagrant、OpenVZ、VirtualBox ...

ISBN#

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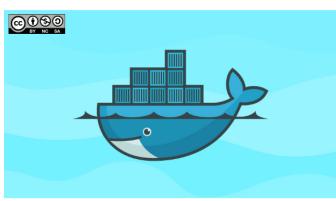
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Netkiller 手札系列电子书 <http://www.netkiller.cn>



Netkiller Virtualization 手札

陈景峯 著



<http://www.netkiller.cn>  
<http://netkiller.github.io>  
<http://netkiller.sourceforge.net>

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知乎专栏 <https://www.zhihu.com/column/netkiller>

\$Date\$

## 致读者

Netkiller 系列手札 已经被 Github 收录，并备份保存在北极地下250米深的代码库中，备份会保留1000年。



Preserving open source software for future generations

The world is powered by open source software. It is a hidden cornerstone of modern civilization, and the shared heritage of all humanity.

The GitHub Arctic Code Vault is a data repository preserved in the Arctic World Archive (AWA), a very-long-term archival facility 250 meters deep in the permafrost of an Arctic mountain.

We are collaborating with the Bodleian Library in Oxford, the Bibliotheca Alexandrina in Egypt, and Stanford Libraries in California to store copies of 17,000 of GitHub's most popular and most-depended-upon projects—open source's “greatest hits”—in their archives, in museum-quality cases, to preserve them for future generations.

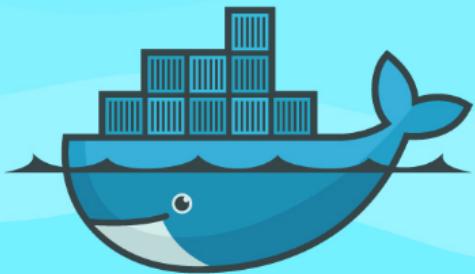
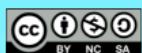
<https://archiveprogram.github.com/arctic-vault/>

# 自述

Netkiller 手札系列电子书 <http://www.netkiller.cn>

## Netkiller Virtualization 手札

陈景峰 著



kubernetes



知乎专栏 <https://www.zhihu.com/column/netkiller>

《Netkiller 系列 手札》是一套免费系列电子书，netkiller 是 nickname 从1999 开使用至今，“手札”是札记，手册的含义。

2003年之前我还是以文章形式在BBS上发表各类技术文章，后来发现文章不够系统，便尝试写长篇技术文章加上章节目录等等。随着内容增加，不断修订，开始发布第一版，第二版.....

IT知识变化非常快，而且具有时效性，这样发布非常混乱，经常有读者发现第一版例子已经过时，但他不知道我已经发布第二版。

我便有一种想法，始终维护一个文档，不断更新，使他保持较新的版本不过时。

第一部电子书是《PostgreSQL 实用实例参考》开始我使用 Microsoft Office Word 慢慢随着文档尺寸增加 word 开始表现出力不从心。

我看到PostgreSQL 中文手册使用SGML编写文档，便开始学习 Docbook SGML。使用Docbook写的第一部电子书是《Netkiller Postfix Integrated Solution》这是Netkiller 系列手札的原型。

至于“手札”一词的来历，是因为我爱好摄影，经常去一个台湾摄影网站，名字就叫“摄影家手札”。

由于硬盘损坏数据丢失 《Netkiller Postfix Integrated Solution》 的 SGML文件已经不存在； Docbook SGML存在很多缺陷 UTF-8支持不好，转而使用Docbook XML.

目前技术书籍的价格一路飙升，动则¥80，¥100，少则¥50，¥60. 技术书籍有时效性，随着技术的革新或淘汰，大批书记成为废纸垃圾。并且这些书技术内容雷同，相互抄袭，质量越来越差，甚至里面给出的例子错误百出，只能购买影印版，或者翻译的版本。

在这种背景下我便萌生了自己写书的想法，资料主要来源是我的笔记与例子。我并不想出版，只为分享，所有我制作了基于CC License 发行的系列电子书。

本书注重例子，少理论（捞干货），只要你对着例子一步一步操作，就会成功，会让你有成就感并能坚持学下去，因为很多人遇到障碍就会放弃，其实我就是这种人，只要让他看到希望，就能坚持下去。

## 1. 写给读者

### 为什么写这篇文章

有很多想法,工作中也用不到所以未能实现, 所以想写出来,和大家分享.有一点写一点,写得也不好,只要能看懂就行,就当学习笔记了.

开始零零碎碎写过一些文档, 也向维基百科供过稿, 但维基经常被ZF封锁, 后来发现sf.net可以提供主机存放文档, 便做了迁移。并开始了我的写作生涯。

这篇文档是作者20年来对工作的总结,是作者一点一滴的积累起来的, 有些笔记已经丢失, 所以并不完整。

因为工作太忙整理比较缓慢。目前的工作涉及面比较窄所以新文档比较少。

我现在花在技术上的时间越来越少, 兴趣转向摄影, 无线电。也想写写摄影方面的心得体会。

写作动力:

曾经在网上看到外国开源界对中国的评价, 中国人对开源索取无度, 但贡献却微乎其微.这句话一直记在我心中, 发誓要为中国开源事业做我仅有的一点微薄贡献

另外写文档也是知识积累, 还可以增加在圈内的影响力.

人跟动物的不同,就是人类可以把自己学习的经验教给下一代人.下一代在上一代的基础上再创新,不断积累才有今天.

所以我把自己的经验写出来,可以让经验传承

没有内容的章节:

目前我自己一人维护所有文档, 写作时间有限, 当我发现一个好主题就会加入到文档中, 待我有时间再完善章节, 所以你会发现很多章节是空无内容的.

文档目前几乎是流水帐式的写作, 维护量很大, 先将就着看吧.

我想到哪写到哪,你会发现文章没一个中心,今天这里写点,明天跳过本

章写其它的.

文中例子绝对多,对喜欢复制然后粘贴朋友很有用,不用动手写,也省时间.

理论的东西,网上大把,我这里就不写了,需要可以去网上查.

我爱写错别字,还有一些是打错的,如果发现请指正.

文中大部分试验是在Debian/Ubuntu/Redhat AS上完成.

## 写给读者

至读者:

我不知道什么时候,我不再更新文档或者退出IT行业去从事其他工作, 我必须给这些文档找一个归宿, 让他能持续更新下去。

我想捐赠给某些基金会继续运转, 或者建立一个团队维护它。

我用了20年时间坚持不停地写作, 持续更新, 才有今天你看到的《Netkiller 手札》系列文档, 在中国能坚持20年, 同时没有任何收益的技术类文档, 是非常不容易的。

有很多时候想放弃, 看到外国读者的支持与国内社区的影响, 我坚持了下来。

中国开源事业需要各位参与, 不要成为局外人, 不要让外国人说: 中国对开源索取无度, 贡献却微乎其微。

我们参与内核的开发还比较遥远, 但是进个人能力, 写一些文档还是可能的。

## 系列文档

下面是我多年积累下来的经验总结, 整理成文档供大家参考:

[Netkiller Architect 手札](#)

[Netkiller Developer 手札](#)

[Netkiller PHP 手札](#)

[Netkiller Python 手札](#)

[Netkiller Testing 手札](#)

[Netkiller Cryptography 手札](#)

[Netkiller Linux 手札](#)  
[Netkiller FreeBSD 手札](#)  
[Netkiller Shell 手札](#)  
[Netkiller Security 手札](#)  
[Netkiller Web 手札](#)  
[Netkiller Monitoring 手札](#)  
[Netkiller Storage 手札](#)  
[Netkiller Mail 手札](#)  
[Netkiller Docbook 手札](#)  
[Netkiller Version 手札](#)  
[Netkiller Database 手札](#)  
[Netkiller PostgreSQL 手札](#)  
[Netkiller MySQL 手札](#)  
[Netkiller NoSQL 手札](#)  
[Netkiller LDAP 手札](#)  
[Netkiller Network 手札](#)  
[Netkiller Cisco IOS 手札](#)  
[Netkiller H3C 手札](#)  
[Netkiller Multimedia 手札](#)  
[Netkiller Management 手札](#)  
[Netkiller Spring 手札](#)  
[Netkiller Perl 手札](#)  
[Netkiller Amateur Radio 手札](#)

## 2. 作者简介

陈景峯 (ネオ チェン)

Nickname: netkiller | English name: Neo chen | Nippon name: ちん  
けいほう (音訳) | Korean name: 천정봉 | Thailand name: ณัมพาพณเชา |  
Vietnam: Trần Cảnh Phong

Callsign: BG7NYT | QTH: ZONE CQ24 ITU44 ShenZhen, China

程序猿，攻城狮，挨踢民工，Full Stack Developer, UNIX like Evangelist, 业余无线电爱好者（呼号：BG7NYT），户外运动，山地骑行以及摄影爱好者。

《Netkiller 系列 手札》的作者

### 成长阶段

1981年1月19日(庚申年腊月十四)出生于黑龙江省青冈县建设乡双富大队第一小队

1989年9岁随父母迁居至黑龙江省伊春市，悲剧的天朝教育，不知道那门子归定，转学必须降一级，我本应该上一年级，但体制让我上学前班，那年多都10岁了

1995年小学毕业，体制规定借读要交3000两银子(我曾想过不升初中)，亲戚单位分楼告别平房，楼里没有地方放东西，把2麻袋书送给我，无意中发现一本电脑书BASIC语言，我竟然看懂了，对于电脑知识追求一发而不可收，后面顶零花钱，压岁钱主要用来买电脑书《MSDOS 6.22》《新编Unix实用大全》《跟我学Foxbase》。。。。。

1996年第一次接触UNIX操作系统，BSD UNIX, Microsoft Xinux(盖茨亲自写的微软Unix，知道的人不多)

1997年自学Turbo C语言，苦于没有电脑，后来学校建了微机室才第一次使用QBASIC(DOS 6.22自带命令)，那个年代只能通过软盘拷贝转播，Trubo C编译器始终没有搞到，

1997年第一次上Internet网速只有9600Bps,当时全国兴起各种信息港域名格式是www.xxxx.info.net,访问的第一个网站是NASA下载了很多火星探路者拍回的照片，还有“淞沪”sohu的前身

1998~2000年在哈尔滨学习计算机，充足的上机时间，但老师让我们练打字（明伦五笔/WT）打字不超过80个/每分钟还要强化训练，不过这个给我的键盘功夫打了好底。

1999年学校的电脑终于安装了光驱，在一张工具盘上终于找到了Turbo C, Borland C++与Quick Basic编译器，当时对VGA图形编程非常感兴趣，通过INT33中断控制鼠标，使用绘图函数模仿windows界面。还有操作 UCDOS 中文字库，绘制矢量与点阵字体。

2000年沉迷于Windows NT与Back Office各种技术，神马主域控制器，DHCP, WINS, IIS, 域名服务器，Exchange邮件服务器，MS Proxy, NetMeeting...以及ASP+MS SQL开发；用56K猫下载了一张LINUX。ISO镜像，安装后我兴奋的24小时没有睡觉。

## 职业生涯

2001年来深圳进城打工,成为一名外来务工者.在一个4人公司做PHP开发，当时PHP的版本是2.0,开始使用Linux Redhat 6.2.当时很多门户网站都是用FreeBSD,但很难搞到安装盘，在网易社区认识了一个网友,从广州给我寄了一张光盘，FreeBSD 3.2

2002年我发现不能埋头苦干,还要学会"做人".后辗转广州工作了半年，考了一个Cisco CCNA认证。回到深圳重新开始，在车公庙找到一家工作做Java开发

2003年这年最惨,公司拖欠工资16000元,打过两次官司2005才付清.

2004 年开始加入[分布式计算](#)团队,[目前成绩](#), 工作仍然是Java开发并且开始使用PostgreSQL数据库。

2004-10月开始玩户外和摄影

2005-6月成为中国无线电运动协会会员,呼号BG7NYT,进了一部Yaesu FT-60R手台。公司的需要转回PHP与MySQL, 相隔几年发现PHP进步很大。在前台展现方面无人能敌, 于是便前台使用PHP, 后台采用Java开发。

2006 年单身生活了这么多年,终于找到归宿. 工作更多是研究PHP各种框架原理

2007 物价上涨,金融危机, 休息了4个月 (其实是找不到工作) , 关外很难上439.460中继, 搞了一台Yaesu FT-7800.

2008 终于找到英文学习方法, 《Netkiller Developer 手札》, 《Netkiller Document 手札》

2008-8-8 08:08:08 结婚,后全家迁居湖南省常德市

2009 《Netkiller Database 手札》,2009-6-13学车, 年底拿到C1驾照

2010 对电子打击乐产生兴趣, 计划学习爵士鼓。由于我对Linux热爱, 我轻松的接管了公司的运维部, 然后开发运维两把抓。我印象最深刻的是公司一次上架10个机柜, 我们用买服务器纸箱的钱改善伙食。我将40多台服务器安装BOINC做压力测试, 获得了中国第二的名次。

2011 平凡的一年, 户外运动停止, 电台很少开, 中继很少上, 摄影主要是拍女儿与家人, 年末买了一辆山地车

2012 对油笔画产生了兴趣, 活动基本是骑行银湖山绿道,

2013 开始学习民谣吉他, 同时对电吉他也极有兴趣; 最终都放弃了。这一年深圳开始推数字中继2013-7-6日入手Motorola

MOTOTRBO XIR P8668, Netkiller 系列手札从Sourceforge向Github迁移；年底对MYSQL UDF, Engine与PHP扩展开发产生很浓的兴趣，拾起遗忘10+年的C，写了几个mysql扩展（图片处理，fifo管道与ZeroMQ），10月份入Toyota Rezi 2.5V并写了一篇《攻城狮的苦逼选车经历》

2014-9-8 在淘宝上买了一架电钢琴 Casio Privia PX-5S pro 开始陪女儿学习钢琴，由于这家钢琴是合成器电钢，里面有打击乐，我有对键盘鼓产生了兴趣。

2014-10-2号罗浮山两日游，对中国道教文化与音乐产生了兴趣，10月5号用了半天时间学会了简谱。10月8号入Canon 5D Mark III + Canon Speedlite 600EX-RT香港过关被查。

2014-12-20号对乐谱制作产生兴趣  
(<https://github.com/SheetMusic/Piano>)，给女儿做了几首钢琴伴奏曲，MuseScore制谱然后生成MIDI与WAV文件。

2015-09-01 晚饭后拿起爵士鼓基础教程尝试在Casio Privia PX-5S pro演练，经过反复琢磨加上之前学钢琴的乐理知识，终于在02号晚上，打出了简单的基本节奏，迈出了第一步。

2016 对弓箭（复合弓）产生兴趣，无奈天朝法律法规不让玩。每周游泳轻松1500米无压力，年底入xbox one s 和 Yaesu FT-2DR，同时开始关注功放音响这块

2017 7月9号入 Yamaha RX-V581 功放一台，连接Xbox打游戏爽翻了，入Kindle电子书，计划学习蝶泳，果断放弃运维和开发知识体系转攻区块链。

2018 从溪山美地搬到半岛城邦，丢弃了多年攒下的家底。11月开始玩 MMDVM，使用 Yaesu FT-7800 发射，连接MMDVM中继板，树莓派，覆盖深圳湾，散步骑车通联两不误。

2019 卖了常德的房子，住了5次院，哮喘反复发作，决定停止电子书更新，兴趣转到知乎，B站

2020 准备找工作

职业生涯路上继续打怪升级

### 3. 如何获得文档

下载 Netkiller 手札 (epub,kindle,chm,pdf)

EPUB <https://github.com/netkiller/netkiller.github.io/tree/master/download epub>

MOBI <https://github.com/netkiller/netkiller.github.io/tree/master/download mobi>

PDF <https://github.com/netkiller/netkiller.github.io/tree/master/download pdf>

CHM <https://github.com/netkiller/netkiller.github.io/tree/master/download chm>

通过 GIT 镜像整个网站

<https://github.com/netkiller/netkiller.github.com.git>

```
$ git clone https://github.com/netkiller/netkiller.github.com.git
```

镜像下载

整站下载

```
wget -m http://www.netkiller.cn/index.html
```

指定下载

```
wget -m wget -m http://www.netkiller.cn/linux/index.html
```

**Yum** 下载文档

获得光盘介质，RPM包，DEB包，如有特别需要，请联系我

YUM 在线安装电子书

<http://netkiller.sourceforge.net/pub/repo/>

```
# cat >> /etc/yum.repos.d/netkiller.repo <<EOF
[netkiller]
```

```
name=Netkiller Free Books
baseurl=http://netkiller.sourceforge.net/pub/repo/
enabled=1
gpgcheck=0
gpgkey=
EOF
```

## 查找包

```
# yum search netkiller

netkiller-centos.x86_64 : Netkiller centos Cookbook
netkiller-cryptography.x86_64 : Netkiller cryptography Cookbook
netkiller-docbook.x86_64 : Netkiller docbook Cookbook
netkiller-linux.x86_64 : Netkiller linux Cookbook
netkiller-mysql.x86_64 : Netkiller mysql Cookbook
netkiller-php.x86_64 : Netkiller php Cookbook
netkiller-postgresql.x86_64 : Netkiller postgresql Cookbook
netkiller-python.x86_64 : Netkiller python Cookbook
netkiller-version.x86_64 : Netkiller version Cookbook
```

## 安装包

```
yum install netkiller-docbook
```

## 4. 打赏 (Donations)

If you like this documents, please make a donation to support the authors' efforts. Thank you!

您可以通过微信，支付宝，贝宝给作者打赏。

### 银行(Bank)

招商银行(China Merchants Bank)

开户名：陈景峰

账号：9555500000007459

### 微信 (Wechat)



### 支付宝 (Alipay)



### PayPal Donations

<https://www.paypal.me/netkiller>

## 5. 联系方式

主站 <http://www.netkiller.cn/>

备用 <http://netkiller.github.io/>

繁体网站 <http://netkiller.sourceforge.net/>

### 联系作者

Mobile: +86 13113668890

Email: netkiller@msn.com

QQ群: 128659835 请注明“读者”

QQ: 13721218

ICQ: 101888222

注: 请不要问我安装问题!

### 博客 Blogger

知乎专栏 <https://zhuanlan.zhihu.com/netkiller>

LinkedIn: <http://cn.linkedin.com/in/netkiller>

OSChina: <http://my.oschina.net/neochen/>

Facebook: <https://www.facebook.com/bg7nyt>

Flickr: <http://www.flickr.com/photos/bg7nyt/>

Disqus: <http://disqus.com/netkiller/>

solidot: <http://solidot.org/~netkiller/>

SegmentFault: <https://segmentfault.com/u/netkiller>

Reddit: <https://www.reddit.com/user/netkiller/>

Digg: <http://www.digg.com/netkiller>

Twitter: <http://twitter.com/bg7nyt>

weibo: <http://weibo.com/bg7nyt>

## Xbox club

我的 xbox 上的ID是 netkiller xbox，我创建了一个俱乐部  
netkiller 欢迎加入。

## Radio

CQ CQ CQ DE BG7NYT:

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Personal Amateur Radiostations of P.R.China

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Best Regards, VY 73! OP. BG7NYT

守听频率 DMR 438.460 -8 Color 12 Slot 2 Group 46001

守听频率 C4FM 439.360 -5 DN/VW

**MMDVM Hotspot:**

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YSF: YSF80337 - CN China 1 - W24166/TG46001

DMR: BM\_China\_46001 - DMR Radio ID: 4600441

# 第 1 章 Docker

<https://www.docker.com>

## 1. 安裝 Docker

### 1.1. Rocky Linux 9.0 / AlmiLinux 9.0 / CentOS 8 Stream

安裝 Docker

```
[root@netkiller ~]# dnf config-manager --add-
repo=https://download.docker.com/linux/centos/docker-ce.repo
Adding repo from: https://download.docker.com/linux/centos/docker-
ce.repo

[root@netkiller ~]# dnf install -y docker-ce docker-compose-plugin

[root@netkiller ~]# systemctl enable docker
[root@netkiller ~]# systemctl start docker
```

```
[root@netkiller ~]# docker -v
Docker version 19.03.12, build 48a66213fe
```

添加容器管理员

```
GID=$(egrep -o 'docker:x:([0-9]+)' /etc/group | egrep -o '([0-9]+)')
adduser -u ${GID} -g ${GID} -G wheel -c "Container Administrator" docker
```

```
[root@netkiller ~]# id docker
uid=986(docker) gid=986(docker) groups=986(docker),10(wheel)
```

## 配置 sudo 无需密码

```
cat > /etc/sudoers.d/docker <<-EOF
docker    ALL=(ALL)      NOPASSWD: ALL
EOF
```

## 检查 sudo 是否工作正常

```
[root@netkiller ~]# su - docker
Last login: Mon Mar 21 15:43:39 CST 2022 on pts/3

[docker@netkiller ~]$ docker ps
CONTAINER ID        IMAGE               COMMAND       CREATED          STATUS          PORTS          NAMES

[docker@izt4nazp2u494r8pldr1zdZ ~]$ sudo ls /sbin
```

## docker-compose 2.x

### 正常情况使用 docker-compose-plugin 安装

```
[root@netkiller ~]# dnf install -y docker-compose-plugin
```

### 如需手工安装

```
DOCKER_CONFIG=${DOCKER_CONFIG:-$HOME/.docker}
mkdir -p $DOCKER_CONFIG/cli-plugins
curl -SL
https://github.com/docker/compose/releases/download/v2.2.3/docker-
compose-linux-x86_64 -o $DOCKER_CONFIG/cli-plugins/docker-compose
chmod +x $DOCKER_CONFIG/cli-plugins/docker-compose
```

使用 docker compose version 命令查看版本好，确认 docker compose 被成功安装

```
[root@netkiller ~]# docker compose version
Docker Compose version v2.6.0

[root@netkiller ~]# alias docker-compose='docker compose'
[root@netkiller ~]# docker-compose version
Docker Compose version v2.6.0
```

## 切换镜像

```
[root@netkiller ~]# cat << EOF > /etc/docker/daemon.json
>
> {
>   "registry-mirrors": [
>     "https://hub-mirror.c.163.com",
>     "https://mirror.baidubce.com",
>     "https://docker.mirrors.ustc.edu.cn/"
>   ]
> }
>
> EOF

[root@netkiller ~]# cat /etc/docker/daemon.json

{
  "registry-mirrors": [
    "https://hub-mirror.c.163.com",
    "https://mirror.baidubce.com",
    "https://docker.mirrors.ustc.edu.cn/"
  ]
}

[root@netkiller ~]# systemctl restart docker

[root@netkiller ~]# docker info
Client:
  Context:    default
  Debug Mode: false
```

```
Plugins:
  app: Docker App (Docker Inc., v0.9.1-beta3)
  buildx: Build with BuildKit (Docker Inc., v0.5.1-docker)
  scan: Docker Scan (Docker Inc., v0.8.0)

Server:
  Containers: 0
    Running: 0
    Paused: 0
    Stopped: 0
  Images: 0
    Server Version: 20.10.7
    Storage Driver: overlay2
      Backing Filesystem: xfs
      Supports d_type: true
      Native Overlay Diff: true
      userxattr: false
    Logging Driver: json-file
    Cgroup Driver: cgroupfs
    Cgroup Version: 1
  Plugins:
    Volume: local
    Network: bridge host ipvlan macvlan null overlay
    Log: awslogs fluentd gcplogs gelf journald json-file local logentries
    splunk syslog
  Swarm: inactive
  Runtimes: io.containerd.runc.v2 io.containerd.runtime.v1.linux runc
  Default Runtime: runc
  Init Binary: docker-init
  containerd version: e25210fe30a0a703442421b0f60afac609f950a3
  runc version: v1.0.1-0-g4144b63
  init version: de40ad0
  Security Options:
    seccomp
      Profile: default
  Kernel Version: 4.18.0-326.el8.x86_64
  Operating System: CentOS Stream 8
  OSType: linux
  Architecture: x86_64
  CPUs: 4
  Total Memory: 7.514GiB
  Name: netkiller
  ID: 5GBU:CMWS:VIVP:TREZ:Y5AP:OGOW:EABK:NP4R:AWUA:S4J2:2YQ2:U7MT
  Docker Root Dir: /var/lib/docker
  Debug Mode: false
  Registry: https://index.docker.io/v1/
  Labels:
    Experimental: false
  Insecure Registries:
    127.0.0.0/8
  Registry Mirrors:
```

```
https://hub-mirror.c.163.com/
https://mirror.baidubce.com/
https://docker.mirrors.ustc.edu.cn/
Live Restore Enabled: false
```

## 1.2. Ubuntu docker-ce

从官方网站获得最新社区版

```
#!/bin/bash

sudo apt update

sudo apt remove docker docker-engine docker.io containerd runc

sudo apt install \
    apt-transport-https \
    ca-certificates \
    curl \
    gnupg \
    lsb-release

curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o /usr/share/keyrings/docker-archive-keyring.gpg

echo \
  "deb [arch=amd64 signed-by=/usr/share/keyrings/docker-archive-keyring.gpg] https://download.docker.com/linux/ubuntu \
  $(lsb_release -cs) stable" | sudo tee \
  /etc/apt/sources.list.d/docker.list > /dev/null

<!-- sudo add-apt-repository \
  "deb [arch=amd64] https://download.docker.com/linux/ubuntu \
  $(lsb_release -cs) \
  stable" -->

sudo apt update
sudo apt install docker-ce docker-ce-cli containerd.io

apt-cache madison docker-ce
```

查看 docker 运行状态

```
root@production:~# systemctl status docker
● docker.service - Docker Application Container Engine
  Loaded: loaded (/lib/systemd/system/docker.service; enabled; vendor
preset: enabled)
    Active: active (running) since Tue 2021-08-17 11:25:04 CST; 57s ago
      Docs: https://docs.docker.com
   Main PID: 7379 (dockerd)
     CGroup: /system.slice/docker.service
             └─7379 /usr/bin/dockerd -H fd:// --
containerd=/run/containerd/containerd.sock

Aug 17 11:25:04 production dockerd[7379]: time="2021-08-
17T11:25:04.708262132+08:00" level=info msg="ClientConn switching
balancer to \"pick_first\" module=grpc"
Aug 17 11:25:04 production dockerd[7379]: time="2021-08-
17T11:25:04.742384618+08:00" level=warning msg="Your kernel does not
support swap memory limit"
Aug 17 11:25:04 production dockerd[7379]: time="2021-08-
17T11:25:04.742397707+08:00" level=warning msg="Your kernel does not
support CPU realtime scheduler"
Aug 17 11:25:04 production dockerd[7379]: time="2021-08-
17T11:25:04.742489785+08:00" level=info msg="Loading containers: start."
Aug 17 11:25:04 production dockerd[7379]: time="2021-08-
17T11:25:04.811316570+08:00" level=info msg="Default bridge (docker0) is
assigned with an IP address 172.18.0.0/16. Daemon option --bip can be
used"
Aug 17 11:25:04 production dockerd[7379]: time="2021-08-
17T11:25:04.836024290+08:00" level=info msg="Loading containers: done."
Aug 17 11:25:04 production dockerd[7379]: time="2021-08-
17T11:25:04.858428922+08:00" level=info msg="Docker daemon"
commit=b0f5bc3 graphdriver(s)=overlay2 version=20.10.7
Aug 17 11:25:04 production dockerd[7379]: time="2021-08-
17T11:25:04.858470910+08:00" level=info msg="Daemon has completed
initialization"
Aug 17 11:25:04 production systemd[1]: Started Docker Application
Container Engine.
Aug 17 11:25:04 production dockerd[7379]: time="2021-08-
17T11:25:04.875279830+08:00" level=info msg="API listen on
/var/run/docker.sock"
```

## 启动参数配置 /etc/default/docker

```
neo@ubuntu:~$ cat /etc/default/docker
# Docker Upstart and SysVinit configuration file
```

```
#  
# THIS FILE DOES NOT APPLY TO SYSTEMD  
#  
# Please see the documentation for "systemd drop-ins":  
# https://docs.docker.com/engine/admin/systemd/  
#  
# Customize location of Docker binary (especially for development  
# testing).  
#DOCKERD="/usr/local/bin/dockerd"  
  
# Use DOCKER_OPTS to modify the daemon startup options.  
#DOCKER_OPTS="--dns 8.8.8.8 --dns 8.8.4.4"  
  
# If you need Docker to use an HTTP proxy, it can also be specified  
# here.  
#export http_proxy="http://127.0.0.1:3128/"  
  
# This is also a handy place to tweak where Docker's temporary files go.  
#export DOCKER_TMPDIR="/mnt/bigdrive/docker-tmp"
```

## 启动脚本 /etc/init/docker.conf

```
neo@ubuntu:~$ sudo cat /etc/init/docker.conf  
[sudo] password for neo:  
description "Docker daemon"  
  
start on (filesystem and net-device-up IFACE!=lo)  
stop on runlevel [!2345]  
  
limit nofile 524288 1048576  
  
# Having non-zero limits causes performance problems due to accounting  
overhead  
# in the kernel. We recommend using cgroups to do container-local  
accounting.  
limit nproc unlimited unlimited  
  
respawn  
  
kill timeout 20  
  
pre-start script  
    # see also https://github.com/tianon/cgroupfs-  
mount/blob/master/cgroupfs-mount  
    if grep -v '^#' /etc/fstab | grep -q cgroup \
```

```

    || [ ! -e /proc/cgroups ] \
    || [ ! -d /sys/fs/cgroup ]; then
        exit 0
    fi
    if ! mountpoint -q /sys/fs/cgroup; then
        mount -t tmpfs -o uid=0,gid=0,mode=0755 cgroup
/sys/fs/cgroup
    fi
    (
        cd /sys/fs/cgroup
        for sys in $(awk '!/^#/ { if ($4 == 1) print $1 }'
/proc/cgroups); do
            mkdir -p $sys
            if ! mountpoint -q $sys; then
                if ! mount -n -t cgroup -o $sys cgroup
$sys; then
                    rmdir $sys || true
                fi
            fi
        done
    )
end script

script
    # modify these in /etc/default/$UPSTART_JOB
(/etc/default/docker)
    DOCKERD=/usr/bin/dockerd
    DOCKER_OPTS=
    if [ -f /etc/default/$UPSTART_JOB ]; then
        . /etc/default/$UPSTART_JOB
    fi
    exec "$DOCKERD" $DOCKER_OPTS --raw-logs
end script

# Don't emit "started" event until docker.sock is ready.
# See https://github.com/docker/docker/issues/6647
post-start script
    DOCKER_OPTS=
    DOCKER_SOCKET=
    if [ -f /etc/default/$UPSTART_JOB ]; then
        . /etc/default/$UPSTART_JOB
    fi

    if ! printf "%s" "$DOCKER_OPTS" | grep -qE -e '-H|--host'; then
        DOCKER_SOCKET=/var/run/docker.sock
    else
        DOCKER_SOCKET=$(printf "%s" "$DOCKER_OPTS" | grep -oP -e
'(-H|--host)\W*unix://\K(\S+)\' | sed 1q)
    fi

    if [ -n "$DOCKER_SOCKET" ]; then

```

```
        while ! [ -e "$DOCKER_SOCKET" ]; do
                initctl status $UPSTART_JOB | grep -qE "
(stop|respawn)/" && exit 1
                echo "Waiting for $DOCKER_SOCKET"
                sleep 0.1
        done
        echo "$DOCKER_SOCKET is up"
fi
end script
```

### 1.3. 测试 Docker

```
neo@MacBook-Pro ~ % docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
1b930d010525: Pull complete
Digest:
sha256:2557e3c07ed1e38f26e389462d03ed943586f744621577a99efb77324b0fe535
Status: Downloaded newer image for hello-world:latest

Hello from Docker!
This message shows that your installation appears to be working
correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker
Hub.
        (amd64)
 3. The Docker daemon created a new container from that image which runs
the
        executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which
sent it
        to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/
```

```

neo@MacBook-Pro ~ % docker image ls
REPOSITORY           TAG      IMAGE ID
CREATED             SIZE
hello-world          latest   fce289e99eb9
fce289e99eb9        2 months ago    1.84kB

neo@MacBook-Pro ~ % docker container ls --all
CONTAINER ID        IMAGE      COMMAND      CREATED
STATUS              PORTS     NAMES
ea694b443e9e       hello-world "/hello"
minute ago          Exited (0) About a minute ago
dreamy_feistel

```

## 1.4. 重置 Docker

```

docker stop $(docker ps -a -q)
docker rm -f $(docker ps -a -q)
docker rmi -f $(docker images -q)
docker volume rm $(docker volume ls -q)

```

## 1.5. 早起版本

### CentOS 7 docker-ce

下载 containerd.io

[https://download.docker.com/linux/centos/7/x86\\_64/stable/Packages/](https://download.docker.com/linux/centos/7/x86_64/stable/Packages/)

```

[root@netkiller ~]# yum install
https://download.docker.com/linux/centos/7/x86_64/stable/Packages/containerd.io-1.2.13-3.2.el7.x86_64.rpm

```

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```

yum install -y yum-utils
yum-config-manager --add-repo

```

```
https://download.docker.com/linux/centos/docker-ce.repo  
yum makecache fast  
yum -y install docker-ce  
  
systemctl start docker
```

测试安装是否成功

```
docker run hello-world
```

## CentOS 6

```
yum install docker-io  
service docker start  
chkconfig docker on  
docker pull centos:latest  
docker images centos
```

test

```
docker run -i -t centos /bin/bash
```

## Ubuntu

Ubuntu 默认版本

```
$ sudo apt update  
$ sudo apt install docker.io  
$ sudo ln -sf /usr/bin/docker.io /usr/local/bin/docker  
$ sudo sed -i '$acomplete -F _docker docker'  
/etc/bash_completion.d/docker.io
```

```
$ sudo docker run -i -t ubuntu /bin/bash
```

## 2. Portainer - Docker 图形管理界面

Portainer 是一个轻量级的 Docker 管理界面，官方提供了 Demo 演示地址

### 2.1. 安装

Server 服务器安装

```
docker volume create portainer_data
docker run -d -p 8000:8000 -p 9000:9000 --name=portainer --restart=always -v
/var/run/docker.sock:/var/run/docker.sock -v portainer_data:/data
portainer/portainer-ce
```

Agent 代理安装

```
docker run -d -p 9001:9001 --name portainer_agent --restart=always -v
/var/run/docker.sock:/var/run/docker.sock -v
/var/lib/docker/volumes:/var/lib/docker/volumes portainer/agent
```

使用 docker-compose 安装

```
version: '3.9'

services:
  portainer:
    image: portainer/portainer-ce
    container_name: portainer
    restart: always
    volumes:
      - /var/run/docker.sock:/var/run/docker.sock
      - portainer:/data
    ports:
      - 8000:8000
      - 9000:9000

  portainer-agent:
    image: portainer/agent
    container_name: portainer-agent
    restart: always
    volumes:
      - /var/run/docker.sock:/var/run/docker.sock
      - /var/lib/docker/volumes:/var/lib/docker/volumes
    ports:
      - 9001:9001
```

```
volumes:  
  portainer:
```

第一台管理服务器，启动管理界面：

```
[root@netkiller portainer]# docker-compose up -d portainer
```

第二台开发环境服务器，启动代理：

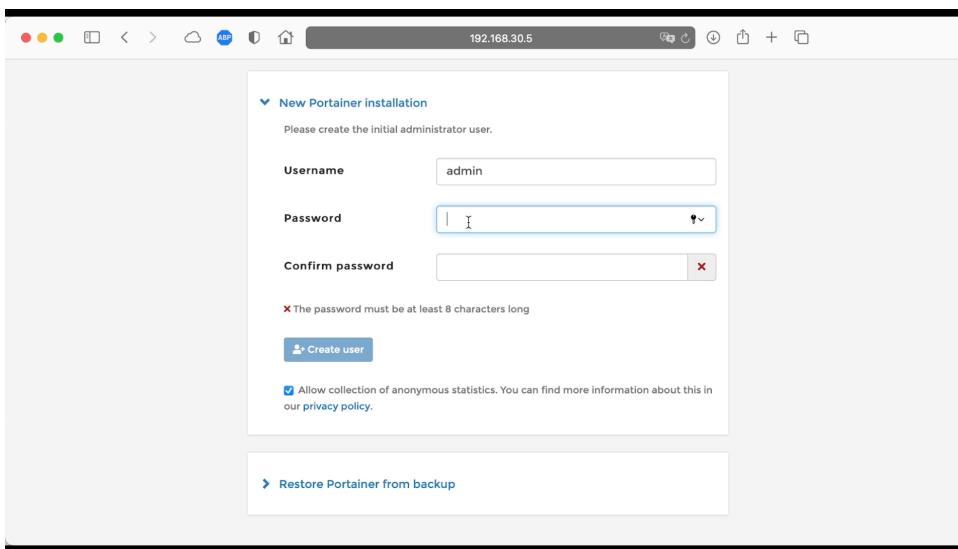
```
[root@development portainer]# docker-compose up -d portainer-agent
```

第三台测试环境服务器，启动代理

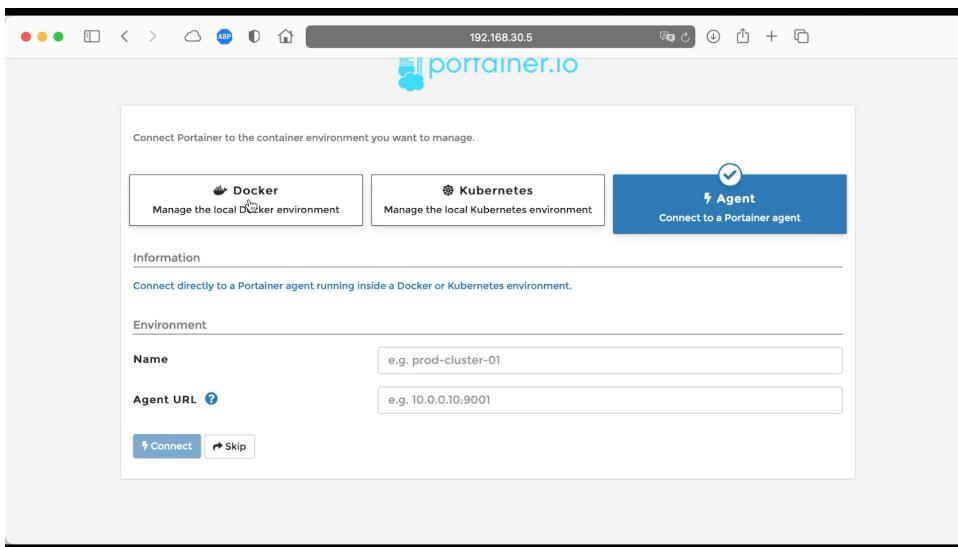
```
[root@testing portainer]# docker-compose up -d portainer-agent
```

## 2.2. 配置 Portainer

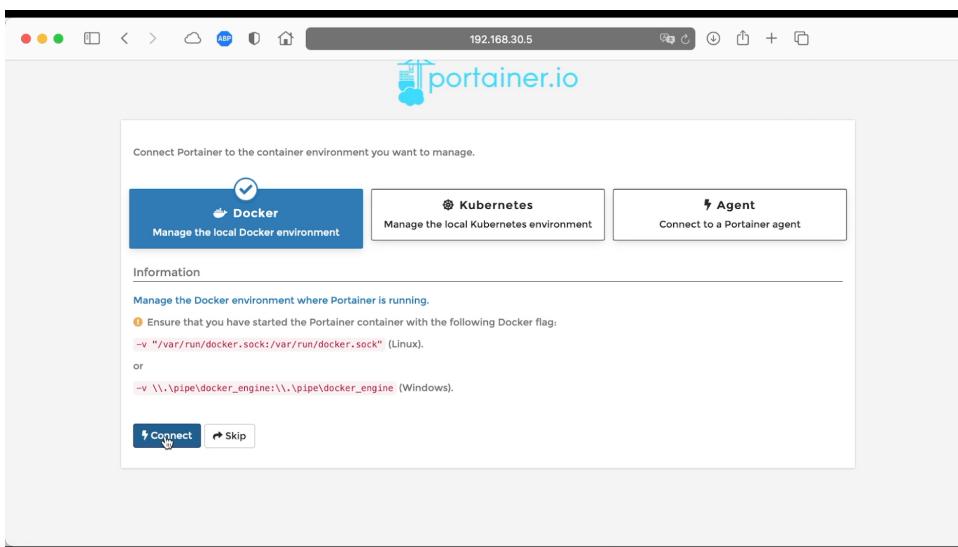
设置管理员密码，创建用户



当前界面中有三个选项，分别是 Docker（本地 Docker），Kubernetes, Agent(代理)



添加本地 Docker，通过 UNIX SOCK 链接，通常是 /var/run/docker.sock



点击 Connect 按钮就可以建立链接

The screenshot shows the Portainer.io interface at version 2.6.2. The left sidebar has 'Endpoints' selected. The main area displays a single endpoint named 'local' which is up and running since 2021-08-04 15:17:48. It contains 1 stack, 1 container (status 100%, 0 errors), 1 volume, and 2 images. The container uses 16.5 GB of memory. The endpoint is grouped under 'Unassigned' and is a 'Standalone' type connected to '/var/run/docker.sock'. A search bar and a refresh button are also present.

添加代理 Docker，左边菜单点击 Endpoints，然后点击 Add endpoint

The screenshot shows the 'Endpoints' management screen. The left sidebar has 'Endpoints' selected. The main area shows a table of endpoints. A new endpoint is being added, indicated by a red 'Add endpoint' button. The table includes columns for Name, Type, URL, Group, and Actions. One entry, 'local', is listed as a Docker type endpoint connected to '/var/run/docker.sock' and unassigned to a group. A search bar and a per-page item selector are also visible.

选择 Agent

The screenshot shows the Portainer.io interface for creating a new endpoint. The left sidebar is dark blue with white text, showing 'portainer.io 2.6.2'. The main area has a light gray header with 'Create endpoint' and 'Endpoints > Add endpoint'. On the right, there's a user icon for 'admin' with 'my account' and 'log out' options. The main content area has a title 'Environment type' with five options: 'Agent' (selected, highlighted in blue), 'Edge Agent', 'Docker', 'Kubernetes', and 'Azure'. Below this is an 'Information' section with a note about deploying the Portainer agent. It shows 'Linux' is selected, while 'Windows' is unselected. Underneath are three deployment methods: 'Kubernetes via load balancer', 'Kubernetes via node port' (selected, highlighted in blue), and 'Docker Swarm'. A command line snippet for Kubernetes via node port is shown: 

```
curl -L https://downloads.portainer.io/portainer-agent-k8s-lb.yaml -o portainer-agent-k8s.yaml; kubectl apply -f portainer-agent-k8s.yaml
```

. A 'Copy command' button is below it. The 'Environment details' section has a 'Name' input field containing 'j.g. docker-prod01 / kubernetes-cluster01'. At the bottom is a large blue 'Add endpoint' button.

Name 给代理起个名气，Endpoint URL 输入代理的IP地址和端口号，Group 是分组（可不选），最后点击 Add endpoint 按钮。

This screenshot shows the same 'Create endpoint' page as above, but with more detailed information filled in. The 'Name' field now contains 'Development(192.168.30.10)'. The 'Endpoint URL' field contains '192.168.30.10:9001'. The 'Public IP' field is empty. The 'Group' dropdown is set to 'Unassigned'. The 'Tags' field is empty. The 'Actions' section at the bottom has a '+ Add endpoint' button. The rest of the interface is identical to the first screenshot.

完成代理的添加

A screenshot of a web browser displaying the Portainer.io interface. The address bar shows the IP address 192.168.30.5. The left sidebar has a dark blue background with white text and icons for Home, SETTINGS, Users, Endpoints (selected), Groups, Tags, Registries, and Settings. The main content area is titled 'Endpoints' with a subtitle 'Endpoint management'. At the top right, there is a green notification bar with a checkmark icon, the text 'Endpoint created', a link to 'my account', and a 'log out' button. Below the notification, the word 'admin' is displayed. The main table has columns for Name, Type, URL, Group, and Actions. It shows two entries: 'local' (Type Docker, URL /var/run/docker.sock, Group Unassigned) and 'Development(192.168.30.10)' (Type Agent, URL 192.168.30.10:9001, Group Office). There are buttons for 'Remove' and '+ Add endpoint'.

回到 Home

A screenshot of the Portainer.io interface showing the 'Home' page. The address bar shows 192.168.30.5. The left sidebar is identical to the previous screenshot. The main content area is titled 'Home' with a subtitle 'Endpoints'. At the top right, it shows 'admin', a link to 'my account', and a 'log out' button. The main table lists two stacks: 'local' (1 stack, 1 container, 1 volume, 2 images, Group: Unassigned) and 'Development(192.168.30.10)' (4 stacks, 8 containers, 2 volumes, 10 images, Group: Office). Both stacks are described as 'Standalone 20.10.7 + Agent' and have URLs like /var/run/docker.sock and 192.168.30.10:9001 respectively. There is a 'Refresh' button and a search bar at the top of the table.

## 2.3. 添加代理出错

portainer 错误日志

```
portainer | 2021/08/04 07:24:14 http error: Unable to initiate communications with endpoint (err=agent already paired with another Portainer instance) (code=500)
portainer | 2021/08/04 07:25:49 http error: Unable to initiate communications with endpoint (err=agent already paired with another Portainer instance) (code=500)
```

## agent 日志

```
portainer-agent | 2021/08/04 07:25:49 http error: Invalid request signature  
(err=Unauthorized) (code=403)  
portainer-agent | 2021/08/04 07:25:49 http error: Invalid request signature  
(err=Unauthorized) (code=403)
```

问题出在，重装了 portainer 先前的 agent 已经与之前的 portainer 建立链接。

解决方法，重装 agent 记得要删除卷。

```
[root@testing portainer]# docker-compose stop portainer-agent  
Stopping portainer-agent ... done  
  
[root@testing portainer]# docker-compose rm -a portainer-agent  
WARNING: --all flag is obsolete. This is now the default behavior of `docker-  
compose rm`  
Going to remove portainer-agent  
Are you sure? [yN] y  
Removing portainer-agent ... done  
  
[root@testing portainer]# docker volume ls  
DRIVER      VOLUME NAME  
local      portainer_portainer  
  
[root@testing portainer]# docker volume rm portainer_portainer  
portainer_portainer  
  
[root@testing portainer]# docker-compose up -d portainer-agent  
Creating volume "portainer_portainer" with default driver  
Creating portainer-agent ... done  
  
[root@testing portainer]# docker-compose ps  
      Name      Command     State            Ports  
-----  
portainer-agent   ./agent    Up      0.0.0.0:9001->9001/tcp, :::9001->9001/tcp
```

### 3. 配置 Docker

#### 3.1. 开启远程访问

修改/etc/sysconfig/docker文件，在最后增加一行DOCKER\_OPTS

```
vim /etc/sysconfig/docker
```

```
DOCKER_OPTS="-H unix:///var/run/docker.sock -H tcp://0.0.0.0:2375"
```

修改/usr/lib/systemd/system/docker.service 在[Service]的ExecStart=下面增加一行\$DOCKER\_OPTS

```
[Unit]
Description=Docker Application Container Engine
Documentation=https://docs.docker.com
BindsTo=containerd.service
After=network-online.target firewalld.service
Wants=network-online.target
Requires=docker.socket

[Service]
Type=notify
# the default is not to use systemd for cgroups because the delegate issues
still
# exists and systemd currently does not support the cgroup feature set required
# for containers run by docker
EnvironmentFile=-/etc/sysconfig/docker
ExecStart=/usr/bin/dockerd $DOCKER_OPTS
ExecReload=/bin/kill -s HUP $MAINPID
TimeoutSec=0
RestartSec=2
Restart=always

# Note that StartLimit* options were moved from "Service" to "Unit" in systemd
229.
# Both the old, and new location are accepted by systemd 229 and up, so using
the old location
# to make them work for either version of systemd.
StartLimitBurst=3

# Note that StartLimitInterval was renamed to StartLimitIntervalSec in systemd
230.
# Both the old, and new name are accepted by systemd 230 and up, so using the
old name to make
# this option work for either version of systemd.
```

```
StartLimitInterval=60s

# Having non-zero Limit*s causes performance problems due to accounting overhead
# in the kernel. We recommend using cgroups to do container-local accounting.
LimitNOFILE=infinity
LimitNPROC=infinity
LimitCORE=infinity

# Comment TasksMax if your systemd version does not supports it.
# Only systemd 226 and above support this option.
TasksMax=infinity

# set delegate yes so that systemd does not reset the cgroups of docker
containers
Delegate=yes

# kill only the docker process, not all processes in the cgroup
KillMode=process

[Install]
WantedBy=multi-user.target
```

重启 docker

```
[root@localhost ~]# systemctl daemon-reload
[root@localhost ~]# systemctl restart docker
```

## /etc/docker/daemon.json

编辑 /etc/docker/daemon.json 文件加入

```
{
  "hosts": [
    "unix:///var/run/docker.sock",
    "tcp://0.0.0.0:2375"
  ]
}
```

重启 docker

```
[root@localhost ~]# systemctl daemon-reload
[root@localhost ~]# systemctl restart docker
```

```
$ docker -H docker.netkiller.cn:2375 info
```

```
$ export DOCKER_HOST="tcp://docker.netkiller.cn:2375"  
$ docker info
```

## 查看端口

```
[root@localhost ~]# ss -lnt | grep 2375  
LISTEN      0      1024          :::2375                           ::::*
```

## 检查 docker 信息

```
[root@localhost ~]# curl -s http://your-docker-ip-address:2375/info  
{"ID": "YNK5:OJTT:FELN:H4DQ:AG7H:W3RE:WGLD:TOOI:32CH:S6HR:AJ45:4VLZ", "Containers": 4, "ContainersRunning": 0, "ContainersPaused": 0, "ContainersStopped": 4, "Images": 10, "Driver": "btrfs", "DriverStatus": [{"Build Version": "Btrfs v4.9.1"}, {"Library Version": "102"}], "SystemStatus": null, "Plugins": {"Volume": ["local"], "Network": ["bridge", "host", "macvlan", "null", "overlay"]}, "Authorization": null, "Log": ["awslogs", "fluentd", "gcplogs", "gelf", "journald", "json-file", "local", "logentries", "splunk", "syslog"]}, "MemoryLimit": true, "SwapLimit": true, "KernelMemory": true, "CpuCfsPeriod": true, "CpuCfsQuota": true, "CPUShares": true, "CPUSet": true, "IPv4Forwarding": true, "BridgeNfIptables": false, "BridgeNfIp6tables": false, "Debug": false, "NFd": 23, "OomKillDisable": true, "NGoroutines": 37, "SystemTime": "2019-01-24T23:30:56.230913047-05:00", "LoggingDriver": "json-file", "CgroupDriver": "cgroupfs", "NEventsListener": 0, "KernelVersion": "3.10.0-693.el7.x86_64", "OperatingSystem": "CentOS Linux 7 (Core)", "OSType": "linux", "Architecture": "x86_64", "IndexServerAddress": "https://index.docker.io/v1/", "RegistryConfig": {"AllowNondistributableArtifactsCIDRs": [], "AllowNondistributableArtifactsHostnames": [], "InsecureRegistryCIDRs": ["127.0.0.0/8"]}, "IndexConfigs": {"docker.io": {"Name": "docker.io", "Mirrors": []}}, "Secure": true, "Official": true}, "Mirrors": []}, "NCPU": 2, "MemTotal": 1958645760, "GenericResources": null, "DockerRootDir": "/var/lib/docker", "HttpProxy": "", "HttpsProxy": "", "NoProxy": "", "Name": "localhost.localdomain", "Labels": []}, "ExperimentalBuild": false, "ServerVersion": "18.09.1", "ClusterStore": "", "ClusterAdvertise": "", "Runtimes": {"runc": {"path": "runc"}}, "DefaultRuntime": "runc", "Swarm": {"NodeID": "", "NodeAddr": "", "LocalNodeState": "inactive", "ControlAvailable": false},
```

```
"Error": "", "RemoteManagers": null}, "LiveRestoreEnabled": false, "Isolation": "", "InitBinary": "docker-init", "ContainerdCommit": {"ID": "9754871865f7fe2f4e74d43e2fc7ccd237edcbce", "Expected": "9754871865f7fe2f4e74d43e2fc7ccd237edcbce"}, "RuncCommit": {"ID": "96ec2177ae841256168fcf76954f7177af9446eb", "Expected": "96ec2177ae841256168fcf76954f7177af9446eb"}, "InitCommit": {"ID": "fec3683", "Expected": "fec3683"}, "SecurityOptions": [{"name=seccomp,profile=default"}], "ProductLicense": "Community Engine", "Warnings": [{"WARNING: API is accessible on http://0.0.0.0:2375 without encryption.\nAccess to the remote API is equivalent to root access on the host. Refer\nto the 'Docker daemon attack surface' section in the documentation for\nmore information: https://docs.docker.com/engine/security/security/#docker-\ndocker-attack-surface", "WARNING: bridge-nf-call-iptables is disabled", "WARNING: bridge-nf-call-ip6tables is disabled"}]}
```

```
$ docker -H 192.168.10.11:2375 info
```

```
DOCKER_HOST=tcp://192.168.57.110:2376
```

## 配置SSL证书

```
{
  "tlsverify": true,
  "tlscert": "/etc/docker/server-cert.pem",
  "tlskey": "/etc/docker/server-key.pem",
  "tlscacert": "/etc/docker/ca.pem",
  "hosts": [
    "unix:///var/run/docker.sock",
    "tcp://0.0.0.0:2376"
  ]
}
```

```
$ docker --tlsverify \
--tlscacert=/Users/neo/test/ca.pem \
--tlscert=/Users/neo/test/cert.pem \
--tlskey=/Users/neo/test/key.pem \
-H=192.168.57.110:2376 \
info
```

我们可以把 ca.pem cert.pem key.pem 三个文件放入客户端 ~/.docker 中，然后配置环境变量就可以简化命令了

```
$ export DOCKER_HOST=tcp://192.168.5.10:2376 DOCKER_TLS_VERIFY=1
$ docker info
```

## 通过 SSH 连接远程 Docker

```
export DOCKER_HOST=ssh://docker-user@host1.example.com
```

```
Neo-iMac:Shell neo$ export DOCKER_HOST=ssh://root@192.168.30.11
Neo-iMac:Shell neo$ docker info
Client:
  Context:    default
  Debug Mode: false
  Plugins:
    buildx: Build with BuildKit (Docker Inc., v0.6.3)
    compose: Docker Compose (Docker Inc., v2.0.0)
    scan: Docker Scan (Docker Inc., v0.8.0)

Server:
  Containers: 9
    Running: 7
    Paused: 0
    Stopped: 2
  Images: 12
  Server Version: 20.10.10
  Storage Driver: overlay2
    Backing Filesystem: xfs
    Supports d_type: true
    Native Overlay Diff: true
    userxattr: false
  Logging Driver: json-file
  Cgroup Driver: cgroupfs
  Cgroup Version: 1
  Plugins:
    Volume: local
    Network: bridge host ipvlan macvlan null overlay
      Log: awslogs fluentd gcplogs gelf journalctl json-file local logentries splunk
    syslog
    Swarm: inactive
  Runtimes: io.containerd.runc.v2 io.containerd.runtime.v1.linux runc
```

```
Default Runtime: runc
Init Binary: docker-init
containerd version: 5b46e404f6b9f661a205e28d59c982d3634148f8
runc version: v1.0.2-0-g52b36a2
init version: de40ad0
Security Options:
    seccomp
        Profile: default
Kernel Version: 4.18.0-348.el8.x86_64
Operating System: CentOS Stream 8
OSType: linux
Architecture: x86_64
CPUs: 4
Total Memory: 15.39GiB
Name: localhost.localdomain
ID: UODB:ETXF:35NV:DDSK:B5QU:RTNZ:7DM4:3ABZ:RZUB:SHOE:W6EP:UK4K
Docker Root Dir: /var/lib/docker
Debug Mode: false
Registry: https://index.docker.io/v1/
Labels:
Experimental: false
Insecure Registries:
    127.0.0.0/8
Registry Mirrors:
    https://registry.docker-cn.com/
    http://hub-mirror.c.163.com/
    https://docker.mirrors.ustc.edu.cn/
Live Restore Enabled: false
```

## 3.2. 镜像配置

### 临时选择镜像

您可以在 Docker 守护进程启动时传入 --registry-mirror 参数：

```
$ docker --registry-mirror=https://registry.docker-cn.com daemon
```

### 切换国内镜像

设置默认镜像，修改 /etc/docker/daemon.json 文件，并添加上 registry-mirrors 键值。

Docker 中国官方镜像

```
{  
    "registry-mirrors": ["https://registry.docker-cn.com"]}
```

```
}
```

## 设置多个镜像

```
{
  "registry-mirrors": [
    "https://registry.docker-cn.com",
    "http://hub-mirror.c.163.com",
    "https://docker.mirrors.ustc.edu.cn"
  ]
}
```

```
"registry-mirrors": [ "https://mirror.ccs.tencentyun.com" ]
```

## 3.3. DNS

/etc/docker/daemon.json

```
{
  "dns": [ "8.8.8.8", "114.114.114.114" ]
}
```

## 3.4. ulimit 资源

/etc/docker/daemon.json

```
"default-ulimits": { "nofile": { "Name": "nofile", "Hard": 128000, "Soft": 128000 } }
```

## 4. docker 命令

### 4.1. docker - A self-sufficient runtime for containers

连接远程主机

TCP 2375

```
Neo-iMac:~ neo$ docker -H 192.168.30.10:2375 info
```

SSH 方式

```
Neo-iMac:~ neo$ docker -H ssh://root@192.168.30.13 info

Client:
  Context:    default
  Debug Mode: false
  Plugins:
    buildx: Build with BuildKit (Docker Inc., v0.6.3)
    compose: Docker Compose (Docker Inc., v2.1.1)
    scan: Docker Scan (Docker Inc., 0.9.0)

Server:
  Containers: 3
    Running: 2
    Paused: 0
    Stopped: 1
  Images: 178
  Server Version: 20.10.11
  Storage Driver: overlay2
    Backing Filesystem: xfs
    Supports d_type: true
    Native Overlay Diff: true
    userxattr: false
  Logging Driver: json-file
  Cgroup Driver: cgroupfs
  Cgroup Version: 1
  Plugins:
    Volume: local
    Network: bridge host ipvlan macvlan null overlay
    Log: awslogs fluentd gcplogs gelf journald json-file local logentries splunk syslog
  Swarm: inactive
  Runtimes: io.containerd.runtime.v1.linux runc io.containerd.runc.v2
  Default Runtime: runc
  Init Binary: docker-init
  containerd version: 7b11cfaabd73bb80907dd23182b9347b4245eb5d
  runc version: v1.0.2-0-g52b36a2
  init version: de40ad0
  Security Options:
    seccomp
      Profile: default
  Kernel Version: 4.18.0-338.el8.x86_64
  Operating System: CentOS Stream 8
  OSType: linux
  Architecture: x86_64
  CPUs: 4
  Total Memory: 7.514GiB
```

```
Name: localhost.localdomain
ID: XGEY:2L25:2GTC:LGK5:3D7D:TC5B:EBBU:5GZJ:VDZ2:S67Z:T7VK:O7WD
Docker Root Dir: /var/lib/docker
Debug Mode: false
Registry: https://index.docker.io/v1/
Labels:
Experimental: false
Insecure Registries:
  registry.netkiller.cn
  127.0.0.0/8
Registry Mirrors:
  https://registry.cn-hangzhou.aliyuncs.com/
  https://docker.mirrors.ustc.edu.cn/
  https://registry.docker-cn.com/
  http://hub-mirror.c.163.com/
Live Restore Enabled: false
```

## 设置 DOCKER\_HOST 环境变量

```
Neo-iMac:~ neo$ export DOCKER_HOST=tcp://192.168.30.10:2375
Neo-iMac:~ neo$ docker info
Client:
  Context:    default
  Debug Mode: false
  Plugins:
    buildx: Build with BuildKit (Docker Inc., v0.6.3)
    compose: Docker Compose (Docker Inc., v2.1.1)
    scan: Docker Scan (Docker Inc., 0.9.0)

Server:
  Containers: 11
    Running: 11
    Paused: 0
    Stopped: 0
  Images: 11
  Server Version: 20.10.10
  Storage Driver: overlay2
    Backing Filesystem: xfs
    Supports d_type: true
    Native Overlay Diff: true
    userxattr: false
  Logging Driver: json-file
  Cgroup Driver: cgroupfs
  Cgroup Version: 1
  Plugins:
    Volume: local
    Network: bridge host ipvlan macvlan null overlay
    Log: awslogs fluentd gcplogs gelf journalctl json-file local logentries splunk syslog
  Swarm: inactive
  Runtimes: io.containerd.runc.v2 io.containerd.runtime.v1.linux runc
  Default Runtime: runc
  Init Binary: docker-init
  containerd version: 5b46e404f6b9f661a205e28d59c982d3634148f8
  runc version: v1.0.2-0-g52b36a2
  init version: de40ad0
  Security Options:
    seccomp
      Profile: default
  Kernel Version: 4.18.0-348.el8.x86_64
  Operating System: CentOS Stream 8
  OSType: linux
  Architecture: x86_64
  CPUs: 4
```

```
Total Memory: 15.39GiB
Name: testing
ID: 5GBU:CMWS:VIVP:TREZ:Y5AP:OGOW:EABK:NP4R:AWUA:S4J2:2YQ2:U7MT
Docker Root Dir: /var/lib/docker
Debug Mode: false
Registry: https://index.docker.io/v1/
Labels:
Experimental: false
Insecure Registries:
 127.0.0.0/8
Registry Mirrors:
 https://hub-mirror.c.163.com/
 https://mirror.baidubce.com/
 https://docker.mirrors.ustc.edu.cn/
Live Restore Enabled: false
```

## 查看 docker 信息

```
neo@MacBook-Pro ~ % docker info
Containers: 9
  Running: 8
  Paused: 0
  Stopped: 1
Images: 5
Server Version: 18.09.2
Storage Driver: overlay2
  Backing Filesystem: extfs
  Supports d_type: true
  Native Overlay Diff: true
Logging Driver: json-file
Cgroup Driver: cgroupfs
Plugins:
  Volume: local
  Network: bridge host macvlan null overlay
  Log: awslogs fluentd gcplogs gelf journalctl json-file local logentries splunk syslog
Swarm: inactive
Runtimes: runc
Default Runtime: runc
Init Binary: docker-init
containerd version: 9754871865f7fe2f4e74d43e2fc7ccd237edcbce
runc version: 09c8266bf2fcf9519a651b04ae54c967b9ab86ec
init version: fec3683
Security Options:
  seccomp
    Profile: default
Kernel Version: 4.9.125-linuxkit
Operating System: Docker for Mac
OSType: linux
Architecture: x86_64
CPUs: 4
Total Memory: 1.952GiB
Name: linuxkit-025000000001
ID: IT7A:OHXM:HG4E:HGX3:ZMA3:GIRA:CYMP:6IJF:QKZ5:MQI4:6LU2:ZD7Z
Docker Root Dir: /var/lib/docker
Debug Mode (client): false
Debug Mode (server): true
  File Descriptors: 70
  Goroutines: 88
  System Time: 2019-03-31T04:23:51.43837431Z
  EventsListeners: 2
HTTP Proxy: gateway.docker.internal:3128
HTTPS Proxy: gateway.docker.internal:3129
Registry: https://index.docker.io/v1/
```

```
Labels:  
Experimental: false  
Insecure Registries:  
 127.0.0.0/8  
Live Restore Enabled: false  
Product License: Community Engine
```

iMac

```
iMac:~ neo$ docker info  
Client:  
  Debug Mode: false  
  Plugins:  
    buildx: Build with BuildKit (Docker Inc., v0.3.1-tp-docker)  
    scan: Docker Scan (Docker Inc., v0.3.3)  
    app: Docker Application (Docker Inc., v0.8.0)  
  
Server:  
  Containers: 0  
  Running: 0  
  Paused: 0  
  Stopped: 0  
  Images: 0  
  Server Version: 19.03.13-beta2  
  Storage Driver: overlay2  
    Backing Filesystem: extfs  
    Supports d_type: true  
    Native Overlay Diff: true  
  Logging Driver: json-file  
  Cgroup Driver: cgroupfs  
  Plugins:  
    Volume: local  
    Network: bridge host ipvlan macvlan null overlay  
    Log: awslogs fluentd gcplogs gelf journald json-file local logentries splunk syslog  
  Swarm: inactive  
  Runtimes: runc  
  Default Runtime: runc  
  Init Binary: docker-init  
  containerd version: 7ad184331fa3e55e52b890ea95e65ba581ae3429  
  runc version: dc9208a3303feef5b3839f4323d9beb36df0a9dd  
  init version: fec3683  
  Security Options:  
    seccomp  
      Profile: default  
  Kernel Version: 4.19.76-linuxkit  
  Operating System: Docker Desktop  
  OSType: linux  
  Architecture: x86_64  
  CPUs: 2  
  Total Memory: 3.848GiB  
  Name: docker-desktop  
  ID: LWQ5:KBRL:SE7U:SJZ4:ANS2:JEQD:5YJO:MVRG:HIEA:XDWD:LQIZ:EJPX  
  Docker Root Dir: /var/lib/docker  
  Debug Mode: false  
  HTTP Proxy: gateway.docker.internal:3128  
  HTTPS Proxy: gateway.docker.internal:3129  
  Registry: https://index.docker.io/v1/  
  Labels:  
    Experimental: true  
    Insecure Registries:  
      127.0.0.0/8  
  Registry Mirrors:  
    https://registry.docker-cn.com/
```

```
Live Restore Enabled: false  
Product License: Community Engine
```

## run

run

```
$ sudo docker run ubuntu:14.04 /bin/echo 'Hello world'  
Hello world
```

查看 docker run 参数

```
pip3 install runlike
```

```
格式: runlike -p <容器名>|<容器ID>
```

-it

```
neo@Netkiller-iMac ~> docker run -it nginx:latest /bin/sh
```

--restart 参数

该参数用于指定自动重启docker容器策略，包含3个选项：no, on-failure[:times], always, unless-stopped

```
no 默认值，表示容器退出时，docker不自动重启容器  
docker run --restart=no [容器名]
```

```
on-failure 若容器的退出状态非0，则docker自动重启容器，还可以指定重启次数，若超过指定次数未能启动容器则放弃  
docker run --restart=on-failure:3 [容器名]
```

```
always 容器退出时总是重启  
docker run --restart=always [容器名]
```

```
unless-stopped 容器退出时总是重启，但不考虑Docker守护进程启动时就已经停止的容器  
docker run --restart=unless-stopped [容器名]
```

--privileged 让 root 具备真正的 root 权限

```
[root@localhost ~]# docker run -t -i centos:latest bash
[root@test /]# lsblk
NAME   MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
vda    254:0    0 59.6G  0 disk
└─vda1 254:1    0 59.6G  0 part /etc/hosts
`-vda2 252:1    0    1G  0 part
[root@test /]# mount /dev/vda2 /mnt/
mount: permission denied
```

加入 --privileged 选项后

```
[root@netkiller ~]# docker run -t -i --privileged centos:latest bash
[root@test /]# mount /dev/vda2 /mnt/
```

设置环境变量

```
docker run -e VAR1=value1 --env VAR2=value2 ubuntu
docker run --env VAR1=value1 --env VAR2=value2 ubuntu
```

DNS

```
docker run --dns 8.8.8.8 busybox:latest
```

add-host

```
docker run --add-host=test.netkiller.cn:172.16.0.73 busybox:latest
```

暴漏端口

```
docker run -p 80:80 ubuntu bash
docker run -p 127.0.0.1:80:80 ubuntu bash
docker run -p 127.0.0.1:80:80/tcp ubuntu bash
```

内存资源分配

-m 或者--memory :分配内存

--memory-swap: 分配临时内存

```
docker run -it -m 200M --memory-swap=400M ubuntu
```

给ubuntu分配200兆内存和400M交换分区，一般memory-swap默认是内存两倍。

### start / stop / restart

```
sudo docker start silly_bohr  
silly_bohr  
  
$ sudo docker stop silly_bohr  
silly_bohr  
  
$ sudo docker restart silly_bohr  
silly_bohr
```

### 更新容器参数

为容器增加 --restart 参数

如果容器启动时没有设置--restart参数，则通过下面命令进行更新：  
docker update --restart=always [容器名]

### ps

OPTIONS说明：  
-a :显示所有的容器，包括未运行的。  
-f :根据条件过滤显示的内容。  
--format :指定返回值的模板文件。  
-l :显示最近创建的容器。  
-n :列出最近创建的n个容器。  
--no-trunc :不截断输出。  
-q :静默模式，只显示容器编号。  
-s :显示总的文件大小。

```
sudo docker ps
```

```
$ sudo docker ps -l  
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES  
84391d1de0fc ubuntu:14.04 /bin/echo Hello worl 31 minutes ago Exit 0 romantic_ritchie
```

不截断输出，显示完整信息

正常情况下无法显示完整的 COMMAND 信息

```
neo@MacBook-Pro-Neo ~ % docker ps
CONTAINER ID        IMAGE               COMMAND
PORTS              NAMES
08252e252e11      eb705d309426      "redis-server /etc/r..."   About a minute ago   Up About a minute
0.0.0.0:6379->6379/tcp, :::6379->6379/tcp      redis
```

使用 --no-trunc 参数可以显示完整信息

```
neo@MacBook-Pro-Neo ~ % docker ps --no-trunc
CONTAINER ID               IMAGE
COMMAND
PORTS                      NAMES
08252e252e113105568f8b60b7bcee2f47978938402e440ba6874221a1621220
sha256:eb705d3094264a13130234869af89b635138f3d05b964ffd6b3ee961f44a664      "redis-server
/etc/redis.conf --requirepass yourpassword"   About a minute ago   Up About a minute
0.0.0.0:6379->6379/tcp, :::6379->6379/tcp      redis
```

格式化输出

格式化选项(--format)

```
.ID 容器ID
.Image 镜像ID
.Command Quoted command
.CreatedAt 创建容器的时间点。
.RunningFor 从容器创建到现在过去的时间。
.Ports 暴露的端口。
.Status 容器状态。
.Size 容器占用硬盘大小。
.Names 容器名称。
.Label 指定label的值 例如'{{.Label "com.docker.swarm.cpu"}}'
.Mounts 挂载到这个容器的数据卷名称
```

```
$ docker ps --format "{{.Names}}={{.ID}}"
portal=04b421501ab7
price=098f85c3c916
admin=8617cb486566
```

kill 信号

```
docker kill -s HUP <CONTAINER ID>
```

## top

```
$ sudo docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
13b2a4a31455 ubuntu:14.04 /bin/bash 3 hours ago Up 3 hours silly_bohr

$ sudo docker top silly_bohr
UID PID PPID C STIME TTY TIME CMD
root 23225 22908 0 12:17 pts/14 00:00:00 /bin/bash
```

## inspect

```
$ sudo docker inspect silly_bohr
[{
    "ID": "13b2a4a3145528d087c9d1580fa78aaa52e8a9bb973c9da923bceb9f9b9e7e5a",
    "Created": "2014-07-17T04:17:45.262480632Z",
    "Path": "/bin/bash",
    "Args": [],
    "Config": {
        "Hostname": "13b2a4a31455",
        "Domainname": "",
        "User": "",
        "Memory": 0,
        "MemorySwap": 0,
        "CpuShares": 0,
        "AttachStdin": true,
        "AttachStdout": true,
        "AttachStderr": true,
        "PortSpecs": null,
        "ExposedPorts": null,
        "Tty": true,
        "OpenStdin": true,
        "StdinOnce": true,
        "Env": [
            "HOME=/",
            "PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin"
        ],
        "Cmd": [
            "/bin/bash"
        ],
        "Dns": [
            "8.8.8.8",
            "8.8.4.4"
        ],
        "Image": "ubuntu",
        "Volumes": null,
        "VolumesFrom": "",
        "WorkingDir": "",
        "Entrypoint": null,
        "NetworkDisabled": false,
        "OnBuild": null
    },
    "State": {
        "Running": true,
        "Pid": 23225,
        "ExitCode": 0,
        "StartedAt": "2014-07-17T04:17:45.672269614Z",
        "FinishedAt": "0001-01-01T00:00:00Z",
        "Ghost": false
    }
},
```

```
"Image": "e54ca5efa2e962582a223ca9810f7f1b62ea9b5c3975d14a5da79d3bf6020f37",
"NetworkSettings": {
    "IPAddress": "172.17.0.2",
    "IPPrefixLen": 16,
    "Gateway": "172.17.42.1",
    "Bridge": "docker0",
    "PortMapping": null,
    "Ports": {}
},
"ResolvConfPath": "/var/lib/docker/containers/13b2a4a3145528d087c9d1580fa78aaa52e8a9bb973c9da923bceb9f9b9e7e5a/resolv.conf",
"HostnamePath": "/var/lib/docker/containers/13b2a4a3145528d087c9d1580fa78aaa52e8a9bb973c9da923bceb9f9b9e7e5a/hostname",
"HostsPath": "/var/lib/docker/containers/13b2a4a3145528d087c9d1580fa78aaa52e8a9bb973c9da923bceb9f9b9e7e5a/hosts",
    "Name": "/silly_bohr",
    "Driver": "aufs",
    "ExecDriver": "native-0.1",
    "Volumes": {},
    "VolumesRW": {},
    "HostConfig": {
        "Binds": null,
        "ContainerIDFile": "",
        "LxcConf": [],
        "Privileged": false,
        "PortBindings": {},
        "Links": null,
        "PublishAllPorts": false
    }
}
}]
```

获取容器名称

```
neo@MacBook-Pro ~ % docker inspect --format='{{.Name}}' $(docker ps -aq)
/redis-cli
/cluster_redisslave3_1
/cluster_redismaster3_1
/cluster_redismaster2_1
/cluster_redisslave2_1
/cluster_redismaster1_1
/cluster_redisslave1_1
/cluster_redis-image_1
/devel_eureka_1
/devel_config_1
/quizzical_heisenberg

neo@MacBook-Pro ~ % docker inspect --format='{{.Name}}' $(docker ps -aq)|cut -d"/" -f2
redis-cli
cluster_redisslave3_1
cluster_redismaster3_1
cluster_redismaster2_1
cluster_redisslave2_1
cluster_redismaster1_1
cluster_redisslave1_1
cluster_redis-image_1
devel_eureka_1
devel_config_1
quizzical_heisenberg
```

#### 容器镜像名称

```
neo@MacBook-Pro ~ % docker inspect --format='{{.Config.Image}}' `docker ps -a -q`  
netkiller/redis:latest  
netkiller/redis  
netkiller/redis  
netkiller/redis  
netkiller/redis  
netkiller/redis  
netkiller/redis  
netkiller/redis  
netkiller/redis:latest  
netkiller/eureka:latest  
netkiller/config:latest  
netkiller/eureka
```

#### 获取容器主机名 Hostname

```
neo@MacBook-Pro ~ % docker inspect --format '{{ .Config.Hostname }}' $(docker ps -q)  
dbea51159085  
79126b58e92a  
5d1fff33a3e1  
42a58cb957d9  
68904b82d071  
70a20dd0396d  
742313f2af46
```

#### 查询 IP 地址

```
$ sudo docker inspect -f '{{ .NetworkSettings.IPAddress }}' silly_bohr
```

```
[root@development ~]# docker ps | grep mysql  
84639b1810a1    mysql:5.7                  "docker-entrypoint.s..."   2 weeks ago      Up 22  
hours          0.0.0.0:3306->3306/tcp, :::3306->3306/tcp, 33060/tcp  
mysql  
  
[root@development ~]# docker inspect -f '{{range .NetworkSettings.Networks}}{{.IPAddress}}{{end}}' mysql  
172.21.0.4
```

```
neo@MacBook-Pro ~ % docker inspect --format='{{range .NetworkSettings.Networks}}{{.IPAddress}}{{end}}' $(docker ps -q)  
172.24.0.7  
172.24.0.6  
172.24.0.5  
172.24.0.4  
172.24.0.3  
172.24.0.2
```

## 获取容器的MAC地址

```
neo@MacBook-Pro ~ % docker inspect --format='{{range .NetworkSettings.Networks}}{{.MacAddress}}{{end}}' $(docker ps -a -q)

02:42:ac:18:00:07
02:42:ac:18:00:06
02:42:ac:18:00:05
02:42:ac:18:00:04
02:42:ac:18:00:03
02:42:ac:18:00:02
```

## 查询子网

```
[root@development ~]# docker network ls | grep nginx
a82ea0e05c7b    nginx_default          bridge      local

[root@development ~]# docker network inspect -f '{{range .IPAM.Config}}{{.Subnet}}{{end}}' nginx_default
172.26.0.0/16
```

## 容器日志

```
neo@MacBook-Pro ~ % docker inspect --format='{{.LogPath}}' `docker ps -a -q` 
/var/lib/docker/containers/dbea511590859fee80565d1c047da2443d62f72f79627c7a97fd891b3ae41168/dbe
a511590859fee80565d1c047da2443d62f72f79627c7a97fd891b3ae41168-json.log
/var/lib/docker/containers/79126b58e92adbe933d8e39966af1e19cd867afe509deca2689fd27e5d25dce7/791
26b58e92adbe933d8e39966af1e19cd867afe509deca2689fd27e5d25dce7-json.log
/var/lib/docker/containers/5d1fff33a3e14d409e2ef675820d68af0fdd6d512a7db06540b02b612eb889cc/5d1
fff33a3e14d409e2ef675820d68af0fdd6d512a7db06540b02b612eb889cc-json.log
/var/lib/docker/containers/42a58cb957d965d5ac0aa5d329c6b68aa7f62cae096f974df99281f50c4819ab/42a
58cb957d965d5ac0aa5d329c6b68aa7f62cae096f974df99281f50c4819ab-json.log
/var/lib/docker/containers/68904b82d071b956757a54c50d95122210e84012542ec3cbe354b72601bf62ba/689
04b82d071b956757a54c50d95122210e84012542ec3cbe354b72601bf62ba-json.log
/var/lib/docker/containers/70a20dd0396d4b48314bfe119d71fc810fe17fcb174d0fb116bb8da53bff677/70a
20dd0396d4b48314bfe119d71fc810fe17fcb174d0fb116bb8da53bff677-json.log
/var/lib/docker/containers/742313f2af466b7b932f8562e0dc75a228c7f815b4eb5a35dd1618d94c88bf7e/742
313f2af466b7b932f8562e0dc75a228c7f815b4eb5a35dd1618d94c88bf7e-json.log
/var/lib/docker/containers/d60dcf49c5d4c78904c442f8fb09e5d3d57a9a2d21f6abaae7ee2d36bcc3e4a2/d60
dcf49c5d4c78904c442f8fb09e5d3d57a9a2d21f6abaae7ee2d36bcc3e4a2-json.log
/var/lib/docker/containers/44c7ea7593838db1cea824862ee9708c77143d0e07d12cae0116cd8231eb2d1c/44c
7ea7593838db1cea824862ee9708c77143d0e07d12cae0116cd8231eb2d1c-json.log
/var/lib/docker/containers/ae3c930f6eca854c9dc1c2ae84b7c870d63f3731290d347dc27fcf85c36821e5/ae3
c930f6eca854c9dc1c2ae84b7c870d63f3731290d347dc27fcf85c36821e5-json.log
/var/lib/docker/containers/9beae3d5f5132e5f733e044d634b1e8b2650c30151db1a8468109bbf891be674/9be
ae3d5f5132e5f733e044d634b1e8b2650c30151db1a8468109bbf891be674-json.log
```

## 获取 json 配置

```

neo@MacBook-Pro ~ % docker inspect --format='{{json .Config}}' dbea51159085 | jq
{
  "Hostname": "dbea51159085",
  "Domainname": "",
  "User": "",
  "AttachStdin": false,
  "AttachStdout": false,
  "AttachStderr": false,
  "ExposedPorts": {
    "6379/tcp": {}
  },
  "Tty": false,
  "OpenStdin": false,
  "StdinOnce": false,
  "Env": [
    "PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin",
    "GOSU_VERSION=1.10",
    "REDIS_VERSION=5.0.4",
    "REDIS_DOWNLOAD_URL=http://download.redis.io/releases/redis-5.0.4.tar.gz",
    "REDIS_DOWNLOAD_SHA=3ce9ceff5a23f60913e1573f6dfcd4aa53b42d4a2789e28fa53ec2bd28c987dd",
    "REDIS_PORT=6379"
  ],
  "Cmd": [
    "redis-cli"
  ],
  "Image": "netkiller/redis:latest",
  "Volumes": {
    "/data": {}
  },
  "WorkingDir": "/data",
  "Entrypoint": [
    "/docker-entrypoint.sh"
  ],
  "OnBuild": null,
  "Labels": {
    "com.docker.compose.config-hash": "f2e8434ec82c796bceac48461d71d487ff3fb53f711220a1efb976c59bd4d68c",
    "com.docker.compose.container-number": "1",
    "com.docker.compose.oneoff": "False",
    "com.docker.compose.project": "cluster",
    "com.docker.compose.service": "redis-cli",
    "com.docker.compose.version": "1.23.2"
  }
}

```

函数

## 拆分和组合

```

neo@MacBook-Pro ~ % docker inspect --format '{{join .Config.Entrypoint " "}}' dbea51159085
/docker-entrypoint.sh

neo@MacBook-Pro ~ % docker inspect --format '{{.HostsPath}}' dbea51159085
/var/lib/docker/containers/dbea511590859fee80565d1c047da2443d62f72f79627c7a97fd891b3ae41168/hosts
neo@MacBook-Pro ~ % docker inspect --format '{{split .HostsPath "/"}}' dbea51159085
[ var lib docker containers dbea511590859fee80565d1c047da2443d62f72f79627c7a97fd891b3ae41168
hosts]

```

## 大小写转换

```
neo@MacBook-Pro ~ % docker inspect --format "{{lower .Name}}" dbea51159085
/redis-cli
neo@MacBook-Pro ~ % docker inspect --format "{{upper .Name}}" dbea51159085
/REDIS-CLI
```

## 首字母大写

```
neo@MacBook-Pro ~ % docker inspect --format "{{title .State.Status}}" dbea51159085
Restarting
```

## 长度计算

```
neo@MacBook-Pro ~ % docker inspect --format '{{len .Name}}' dbea51159085
10
```

## 打印字符串

```
neo@MacBook-Pro ~ % INSTANCE_ID=42a58cb957d9
neo@MacBook-Pro ~ % docker inspect --format '{{.State.Pid}}{{.State.ExitCode}}' $INSTANCE_ID
745770
neo@MacBook-Pro ~ % docker inspect --format '{{print .State.Pid .State.ExitCode}}' $INSTANCE_ID
74577 0
neo@MacBook-Pro ~ % docker inspect --format '{{printf "Pid:%d ExitCode:%d" .State.Pid .State.ExitCode}}' $INSTANCE_ID
Pid:74577 ExitCode:0
neo@MacBook-Pro ~ % docker inspect --format '{{.State.Pid}}{{print "|"}}{{.State.ExitCode}}'
$INSTANCE_ID
74577|0
```

## 综合查询

```
neo@MacBook-Pro ~ % docker inspect --format 'Hostname:{{ .Config.Hostname }} Name:{{ .Name }}
IP:{{range .NetworkSettings.Networks}}{{.IPAddress}}{{end}}' $(docker ps -q)
Hostname:dbea51159085 Name:/redis-cli IP:
Hostname:79126b58e92a Name:/cluster_redisslave3_1 IP:172.24.0.7
Hostname:5d1fff33a3e1 Name:/cluster_redismaster3_1 IP:172.24.0.6
Hostname:42a58cb957d9 Name:/cluster_redismaster2_1 IP:172.24.0.5
Hostname:68904b82d071 Name:/cluster_redisslave2_1 IP:172.24.0.4
Hostname:70a20dd0396d Name:/cluster_redismaster1_1 IP:172.24.0.3
Hostname:742313f2af46 Name:/cluster_redisslave1_1 IP:172.24.0.2
```

```
docker inspect --format '{{ .Config.Hostname }}:{{range .NetworkSettings.Networks}}{{.IPAddress}}{{end}}' $(docker ps -q)
```

### 查看 Mount 目录

```
[root@netkiller ~]# docker inspect gitlab | grep Mounts -A 20
    "Mounts": [
        {
            "Source": "/srv/gitlab/config",
            "Destination": "/etc/gitlab",
            "Mode": "",
            "RW": true,
            "Propagation": "rprivate"
        },
        {
            "Source": "/srv/gitlab/logs",
            "Destination": "/var/log/gitlab",
            "Mode": "",
            "RW": true,
            "Propagation": "rprivate"
        },
        {
            "Source": "/srv/gitlab/data",
            "Destination": "/var/opt/gitlab",
            "Mode": "",
            "RW": true,
            "Propagation": "rprivate"
        }
    ]
```

## 镜像管理

### 查看镜像

```
$ sudo docker images
REPOSITORY TAG IMAGE ID CREATED VIRTUAL SIZE
ubuntu 14.10 58faa899733f 2 weeks ago 196 MB
ubuntu utopic 58faa899733f 2 weeks ago 196 MB
ubuntu precise ea7d6801c538 3 weeks ago 127.5 MB
ubuntu 12.04 ea7d6801c538 3 weeks ago 127.5 MB
ubuntu 12.10 c5881f11ded9 4 weeks ago 172.2 MB
ubuntu quantal c5881f11ded9 4 weeks ago 172.2 MB
ubuntu 13.04 463ff6be4238 4 weeks ago 169.4 MB
ubuntu raring 463ff6be4238 4 weeks ago 169.4 MB
ubuntu 13.10 195eb90b5349 4 weeks ago 184.7 MB
ubuntu saucy
195eb90b5349 4 weeks ago 184.7 MB
ubuntu 14.04 e54ca5efa2e9 4 weeks ago 276.5 MB
ubuntu latest e54ca5efa2e9 4 weeks ago 276.5 MB
ubuntu trusty e54ca5efa2e9 4 weeks ago 276.5 MB
ubuntu 10.04 3db9c44f4520 12 weeks ago 183 MB
ubuntu lucid 3db9c44f4520 12 weeks ago 183 MB
```

## 获取新镜像

```
$ sudo docker pull centos
Pulling repository centos
b7de3133ff98: Pulling dependent layers
5cc9e91966f7: Pulling fs layer
511136ea3c5a: Download complete
ef52fb1fe610: Download complete
```

## 批量删除镜像

```
docker rmi $(docker images --format "{{.ID}}: {{.Repository}}" | grep fscs | cut -d: -f1)
```

## 删除 <none> 镜像

```
neo@MacBook-Pro ~/git/springcloud/webflux % docker images | grep none | cut -f2
<none>                               <none>          0fe48d3d68c6      About an
hour ago   487MB
<none>                               <none>          8372211e8f27      About an
hour ago   487MB
<none>                               <none>          10e486f8b7e0      About an
hour ago   487MB
<none>                               <none>          4e741a99e2f7      About an
hour ago   487MB
<none>                               <none>          ecb48c238139      About an
hour ago   487MB
<none>                               <none>          5fb2543fe938      About an
hour ago   487MB
<none>                               <none>          2638e33e8168      About an
hour ago   487MB
<none>                               <none>          447651629be0      About an
hour ago   470MB
<none>                               <none>          f66e1450b24b      About an
hour ago   487MB
<none>                               <none>          90e5e4ccedb1      2 hours ago
486MB
<none>                               <none>          4de93b767f79      3 hours ago
486MB
<none>                               <none>          746b7846eb74      3 hours ago
470MB
<none>                               <none>          cb45a33c957a      3 hours ago
470MB
<none>                               <none>          7a1e07e37dc6      3 hours ago
105MB

neo@MacBook-Pro ~/git/springcloud/webflux % docker rmi -f $(docker images | grep none | awk
'{print $3}')
Deleted: sha256:0fe48d3d68c6e6784b6080a14a0f06eec55a29f2593b601579ffa3e34e0de6fe
Deleted: sha256:14a1b072ff90eecccd14530b60576fe488917dfbf4e1e369dfc841adf8827e72
Deleted: sha256:08f9d5b08dca78932767195c9188f6c32fccf6a8394ce0955ae280ca785187c2
Deleted: sha256:8372211e8f27dd23093b151a157b990b2d96feec2d3dd9ab38acbd6645c423c9
Deleted: sha256:d47c4aec3dec6beae787a1elab0245e69ca0e0aeaca76db2decaee3c5be13c5c
Deleted: sha256:e791fe1e86eeb86c4195d3558bb67025deaeee36c5430fb83c60ab8c188774667
Deleted: sha256:10e486f8b7e000f5deb920cdd7db4d56fceab689747eda8ba365419d7abb7461
Deleted: sha256:eadccd2521fab18511d5aa1e51184f25442c3e717e29e85ff255c1f4f031ea572
Deleted: sha256:3af7330310b481636cdf756208cac87de4704612f95af2d309aa327b5d1fd30b
```

```
Deleted: sha256:4e741a99e2f707b6957be436d384d087200ebd11c8673b2c0c1e8baef304fbfb
```

批量删除镜像

## logs

显示容器运行日志，用于排查异常情况

```
$ docker logs [OPTIONS] CONTAINER
Options:
  --details          显示更多的信息
  -f, --follow       跟踪实时日志
  --since string     显示自某个timestamp之后的日志，或相对时间，如42m（即42分钟）
  --tail string      从日志末尾显示多少行日志，默认是all
  -t, --timestamps   显示时间戳
  --until string     显示自某个timestamp之前的日志，或相对时间，如42m（即42分钟）
```

例如下面是nginx容易启动出错日志

```
[root@netkiller]# docker logs my-nginx-container
nginx: [emerg] invalid server name or wildcard "www.*.com" on 0.0.0.0:80
nginx: [emerg] invalid server name or wildcard "www.*.com" on 0.0.0.0:80
nginx: [emerg] invalid server name or wildcard "www.*.com" on 0.0.0.0:80
nginx: [emerg] invalid server name or wildcard "www.*.com" on 0.0.0.0:80
nginx: [emerg] invalid server name or wildcard "www.*.com" on 0.0.0.0:80
nginx: [emerg] invalid server name or wildcard "www.*.com" on 0.0.0.0:80
```

跟踪实时日志

```
$ docker logs -f CONTAINER_ID
```

显示时间截

```
$ docker logs -t --since="2018-02-08" --tail=100 CONTAINER_ID
```

显示一段范围内的日志

```
$ docker logs -t --since="2019-02-08T12:20:30" --until "2019-02-09T12:23:30" CONTAINER_ID
```

## 重置 Docker

```
docker ps -aq | xargs docker rm -f  
docker images -aq | xargs docker rmi -f
```

## 仓库操作

<https://docs.docker.com/engine/reference/commandline/login/>

登陆到一个Docker镜像仓库，如果未指定镜像仓库地址，默认为官方仓库 Docker Hub

登陆

```
docker login -u 用户名 -p 密码
```

登陆到私有仓库

```
$ docker login localhost:8080
```

从标准输出传递密码

```
$ cat ~/my_password.txt | docker login --username foo --password-stdin
```

注销

```
docker logout
```

## build

```
$ docker build -f /path/to/a/Dockerfile .
```

## 网络管理

```
docker network create -d bridge --subnet 172.25.0.0/16 private_network  
docker run -d -v /usr/local/etc/redis/redis.conf:/usr/local/etc/redis/redis.conf -p 6379:6379 --network=private_network --name redis redis redis-server /usr/local/etc/redis/redis.conf
```

## 事件信息

```
neo@MacBook-Pro-Neo ~ % docker events  
2020-10-22T21:29:44.289075472+08:00 network create  
8eab34642596e253eb51aa40cc4f5c4c14fb88f1bad7c8cbdeacc2ad411cdb44 (name=search_elastic, type=bridge)  
2020-10-22T21:29:44.304732058+08:00 volume create search_data01 (driver=local)  
2020-10-22T21:29:44.319023013+08:00 volume create search_data02 (driver=local)  
2020-10-22T21:29:44.331507541+08:00 volume create search_data03 (driver=local)  
2020-10-22T21:29:44.584989392+08:00 volume create search_data01 (driver=local)
```

## 从 docker 中复制文件

```
neo@MacBook-Pro-Neo ~ % docker cp 13acbc98fb35:/etc/nginx/nginx.conf nginx/conf
```

## 复制文件和目录

```
[root@localhost nginx]# docker cp nginx:/etc/nginx/nginx.conf .  
[root@localhost nginx]# docker cp nginx:/etc/nginx/conf.d .
```

## 查看历史记录

```
neo@MacBook-Pro-Neo ~/workspace/Linux % docker history prom/prometheus:latest  
IMAGE          CREATED     CREATED BY               SIZE      COMMENT  
267e73020447  9 days ago   /bin/sh -c #(nop)  CMD ["--config.file=/etc/...  0B  
<missing>    9 days ago   /bin/sh -c #(nop)  ENTRYPOINT ["/bin/prometh...  0B  
<missing>    9 days ago   /bin/sh -c #(nop) WORKDIR /prometheus  0B  
<missing>    9 days ago   /bin/sh -c #(nop) VOLUME [/prometheus]  0B  
<missing>    9 days ago   /bin/sh -c #(nop) EXPOSE 9090  0B  
<missing>    9 days ago   /bin/sh -c #(nop) USER nobody  0B  
<missing>    9 days ago   | 2 ARCH=amd64 OS=linux /bin/sh -c mkdir -p /...  1kB  
<missing>    9 days ago   | 2 ARCH=amd64 OS=linux /bin/sh -c ln -s /usr...  70B  
<missing>    9 days ago   /bin/sh -c #(nop) COPY file:ccd2272d74b950d3...  129kB  
<missing>    9 days ago   /bin/sh -c #(nop) COPY file:e56be853b56584e3...  3.65kB  
<missing>    9 days ago   /bin/sh -c #(nop) COPY file:141c5dcfe0148c05...  11.4kB  
<missing>    9 days ago   /bin/sh -c #(nop) COPY dir:fb3645c7e168b5a4c...  19.5kB  
<missing>    9 days ago   /bin/sh -c #(nop) COPY dir:6111a57e3d623c34c...  9.04kB  
<missing>    9 days ago   /bin/sh -c #(nop) COPY file:a1aaf2bddcc0da1d...  934B  
<missing>    9 days ago   /bin/sh -c #(nop) COPY file:32c8fb6cc8e0278c...  91.1MB  
<missing>    9 days ago   /bin/sh -c #(nop) COPY file:a9b6183415409ccb...  102MB
```

```

<missing>      9 days ago    /bin/sh -c #(nop) ARG OS=linux          0B
<missing>      9 days ago    /bin/sh -c #(nop) ARG ARCH=amd64        0B
<missing>      9 days ago    /bin/sh -c #(nop) LABEL maintainer=The Prom... 0B
<missing>      3 months ago   /bin/sh -c #(nop) COPY dir:bb5589ed25434b0b5... 1.44MB
<missing>      3 months ago   /bin/sh -c #(nop) MAINTAINER The Prometheus... 0B
<missing>      3 months ago   /bin/sh -c #(nop) CMD ["sh"]           0B
<missing>      3 months ago   /bin/sh -c #(nop) ADD file:dc794c2febce9ec5b... 1.24MB

```

使用 --no-trunc 可以查看被隐藏的部分

```
neo@MacBook-Pro-Neo ~/workspace/Linux % docker history --no-trunc docker.io/mysql:latest
```

## 安全漏洞扫描

```

Neo-iMac:nginx neo$ docker scan
Usage: docker scan [OPTIONS] IMAGE

A tool to scan your images

Options:
  --accept-license      Accept using a third party scanning provider
  --dependency-tree     Show dependency tree with scan results
  --exclude-base        Exclude base image from vulnerability scanning (requires --file)
  -f, --file string     Dockerfile associated with image, provides more detailed results
  --group-issues         Aggregate duplicated vulnerabilities and group them to a single one
  (requires --json)
  --json                 Output results in JSON format
  --login                Authenticate to the scan provider using an optional token (with --
token), or web base token if empty
  --reject-license       Reject using a third party scanning provider
  --severity string      Only report vulnerabilities of provided level or higher
  (low|medium|high)
  --token string         Authentication token to login to the third party scanning provider
  --version              Display version of the scan plugin
"docker scan" requires exactly 1 argument

```

```

Neo-iMac:nginx neo$ docker scan redis:latest
Neo-iMac:nginx neo$ docker scan 192.168.30.5/netkiller.cn/java

```

## Contexts

```

Neo-iMac:~ neo$ docker context
Manage contexts

Usage:
  docker context [command]

Available Commands:
  create      Create new context

```

```
export      Export a context to a tar or kubeconfig file
import     Import a context from a tar or zip file
inspect   Display detailed information on one or more contexts
list      List available contexts
rm        Remove one or more contexts
show      Print the current context
update    Update a context
use       Set the default context

Flags:
-h, --help  Help for context

Use "docker context [command] --help" for more information about a command.
```

查看

```
Neo-iMac:~ neo$ docker context ls
NAME          TYPE           DESCRIPTION          DOCKER
ENDPOINT
default *      moby           Current DOCKER_HOST based configuration
unix:///var/run/docker.sock
desktop-linux  moby
unix:///Users/neo/.docker/run/docker.sock
swarm
```

创建

```
localhost      default unix:///var/run/docker.sock
Remote host    remote  ssh://user@remotemachine
docker-in-docker  dind   tcp://127.0.0.1:2375
```

```
Neo-iMac:~ neo$ docker context create development --docker "host=ssh://root@192.168.30.11"
development
Successfully created context "development"

Neo-iMac:~ neo$ docker context create testing --docker "host=tcp://192.168.30.11:2376"
testing
Successfully created context "testing"
```

```
Neo-iMac:~ neo$ docker context ls
NAME          TYPE           DESCRIPTION          DOCKER
ENDPOINT
default *      moby           Current DOCKER_HOST based configuration
unix:///var/run/docker.sock
desktop-linux  moby
unix:///Users/neo/.docker/run/docker.sock
development   moby
ssh://root@192.168.30.11
testing       moby
tcp://192.168.30.11:2376
swarm
```

inspect

```
Neo-iMac:~ neo$ docker context inspect
[
    {
        "Name": "default",
        "Metadata": {
            "StackOrchestrator": "swarm"
        },
        "Endpoints": {
            "docker": {
                "Host": "unix:///var/run/docker.sock",
                "SkipTLSVerify": false
            }
        },
        "TLSSMaterial": {},
        "Storage": {
            "MetadataPath": "\u003cIN MEMORY\u003e",
            "TLSPath": "\u003cIN MEMORY\u003e"
        }
    }
]
```

使用 context

切换默认为 development

```
Neo-iMac:~ neo$ docker context use development
development
```

查看，注意 \* 指标

```
Neo-iMac:~ neo$ docker context ls
NAME          TYPE           DESCRIPTION          DOCKER
ENDPOINT
default       moby           KUBERNETES ENDPOINT   ORCHESTRATOR
              Current DOCKER_HOST based configuration
              swarm
desktop-linux  moby
unix:///var/run/docker.sock
development   *
ssh://root@192.168.30.11
testing       moby
tcp://192.168.30.11:2376
```

连接到 development 查看 ps

```
Neo-iMac:~ neo$ docker ps
CONTAINER ID  IMAGE          COMMAND          CREATED          STATUS
```

POR	T			NAMES
be36eb55d2a7	openjdk:8	"java -jar /app/ne...	6 days ago	Up 40 hours api
0.0.0.0:8088->8080/tcp, :::8088->8080/tcp				
5c6892c6d488	redis:alpine	"docker-entrypoint.s..."	2 months ago	Up 2 weeks redis
0.0.0.0:6379->6379/tcp, :::6379->6379/tcp				
9ee2a3aab354	portainer/agent	"/agent"	3 months ago	Up 2 weeks portainer-agent
0.0.0.0:9001->9001/tcp, :::9001->9001/tcp				
84639b1810a1	mysql:5.7	"docker-entrypoint.s..."	3 months ago	Up 2 weeks mysql
0.0.0.0:3306->3306/tcp, :::3306->3306/tcp, 33060/tcp				

删除

```
Neo-iMac:~ neo$ docker context rm testing
testing
```

--context 参数

```
Neo-iMac:~ neo$ docker --context default ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
Neo-iMac:~ neo$ docker --context development ps
CONTAINER ID IMAGE COMMAND CREATED STATUS NAMES
PORTS
be36eb55d2a7 openjdk:8 "java -jar /app/ne..." 6 days ago Up 41 hours
0.0.0.0:8088->8080/tcp, :::8088->8080/tcp api
```

## 4.2. docker-compose - Define and run multi-container applications with Docker.

### Docker Compose v3

#### 安装 docker-compose

使用 pip 安装

```
yum install -y python-pip
pip install docker-compose
```

OSCM 安装

```
curl -s https://raw.githubusercontent.com/oscm/shell/master/virtualization/docker/docker-
compose.sh | bash
```

查看版本号

```
[root@localhost ~]# docker-compose version
docker-compose version 1.29.2, build 5becea4c
docker-py version: 5.0.0
CPython version: 3.7.10
OpenSSL version: OpenSSL 1.1.0l  10 Sep 2019
```

## 快速入门

```
[root@localhost tmp]# cat app.py
import time

import redis
from flask import Flask

app = Flask(__name__)
cache = redis.Redis(host='redis', port=6379)

def get_hit_count():
    retries = 5
    while True:
        try:
            return cache.incr('hits')
        except redis.exceptions.ConnectionError as exc:
            if retries == 0:
                raise exc
            retries -= 1
            time.sleep(0.5)

@app.route('/')
def hello():
    count = get_hit_count()
    return 'Hello World! I have been seen {} times.\n'.format(count)

if __name__ == "__main__":
    app.run(host="0.0.0.0", debug=True)
```

```
[root@localhost tmp]# cat requirements.txt
flask
redis
```

```
[root@localhost tmp]# cat Dockerfile
FROM python:3.4-alpine
ADD . /code
WORKDIR /code
RUN pip install -r requirements.txt
CMD ["python", "app.py"]
```

```
[root@localhost tmp]# cat docker-compose.yml
version: '2'
services:
  web:
    build: .
    ports:
      - "5000:5000"
  redis:
    image: "redis:alpine"
```

## 启动

```
docker-compose up
```

```
[root@localhost docker]# docker-compose up
```

## 守护进程

```
docker-compose up -d
```

## 启动指定服务

```
[root@localhost docker]# docker-compose up mysql
[root@localhost docker]# docker-compose up -d mysql
```

## 指定 yml 文件

```
$ docker-compose -f docker-compose.yml up -d
```

## 停止

### 停止

```
docker-compose down
```

```
[root@localhost docker]# docker-compose down  
Removing docker_membersrv_1 ... done
```

启动

查看进程

```
docker-compose ps
```

```
[root@localhost docker]# docker-compose ps  
      Name           Command          State  
Ports  
-----  
test_membersrv_1   membersrv      Up      0.0.0.0:7054->7054/tcp  
test_vp0_1         sh -c sleep 5; peer node s ...  Up      0.0.0.0:7050->7050/tcp,  
0.0.0.0:7051->7051/tcp, 0.0.0.0:7053->7053/tcp
```

查看日志

```
docker-compose logs -f vp0
```

查看最后100行日志

```
[www@testing api.netkiller.cn]$ sudo docker-compose logs -f --tail=100
```

执行命令

```
docker-compose exec vp0 bash
```

运行

```
docker-compose run vp0 bash
```

#### 4.3. Docker Scan

安装

```
dnf install docker-scan-plugin
```

扫描

```
docker scan nginx
```

## 5. 镜像管理

Docker 镜像地址 <https://registry.hub.docker.com/>

### 5.1. 搜索镜像

```
$ sudo docker search centos |more
NAME                                     DESCRIPTION
STARS      OFFICIAL    AUTOMATED
centos
542        [OK]          The official build of CentOS.
tianon/centos
rinse/instea...   28
ansible/centos7-ansible
13           [OK]          CentOS 5 and 6, created using
saltstack/centos-6-minimal
7            [OK]          Ansible on CentOS7
blalor/centos
7            [OK]          Bare-bones base CentOS 6.5 image
steeef/graphite-centos
Carbon via ng...   6
ariya/centos6-teamcity-server
6            [OK]          CentOS 6.x with Graphite and
tutum/centos
For the root...   5
tutum/centos-6.4
instead. ...   5           [OK]          TeamCity Server 8.1 on CentOS 6
                                         [OK]          Centos image with SSH access.
                                         [OK]          DEPRECATED. Use tutum/centos:6.4
```

### 5.2. 获取镜像

可以使用 docker pull 命令来从官网仓库获取所需要的镜像。

```
$ sudo docker pull ubuntu:14.04
```

等同于

```
$ sudo docker pull registry.hub.docker.com/ubuntu:14.04
```

## 获得所有版本镜像

```
$ sudo docker pull ubuntu

$ sudo docker images
REPOSITORY          TAG      IMAGE ID      CREATED
VIRTUAL SIZE
ubuntu              utopic   277eb4304907  3 days ago
215.6 MB
ubuntu              14.10    277eb4304907  3 days ago
215.6 MB
ubuntu              14.04    5506de2b643b  3 days ago
197.8 MB
ubuntu              trusty   5506de2b643b  3 days ago
197.8 MB
ubuntu              latest   5506de2b643b  3 days ago
197.8 MB
ubuntu              14.04.1  5506de2b643b  3 days ago
197.8 MB
ubuntu              precise  0b310e6bf058  3 days ago
116.1 MB
ubuntu              12.04.5  0b310e6bf058  3 days ago
116.1 MB
ubuntu              12.04    0b310e6bf058  3 days ago
116.1 MB
ubuntu              12.10    c5881f11ded9  4 months ago
172.1 MB
ubuntu              quantal  c5881f11ded9  4 months ago
172.1 MB
ubuntu              13.04    463ff6be4238  4 months ago
169.4 MB
ubuntu              raring   463ff6be4238  4 months ago
169.4 MB
ubuntu              13.10    195eb90b5349  4 months ago
184.6 MB
ubuntu              saucy   195eb90b5349  4 months ago
184.6 MB
ubuntu              10.04   3db9c44f4520  6 months ago
183 MB
ubuntu              lucid   3db9c44f4520  6 months ago
183 MB
```

## 从其他服务器获得镜像

```
$ sudo docker pull dl.dockerpool.com:5000/ubuntu:12.04
```

完成后，即可随时使用该镜像了，例如创建一个容器，让其中运行 bash 应用。

```
$ sudo docker run -t -i ubuntu:14.10 /bin/bash
```

### 5.3. 列出本地镜像

```
$ sudo docker images
REPOSITORY          TAG      IMAGE ID      CREATED
VIRTUAL SIZE
ubuntu              14.10   277eb4304907  3 days ago
215.6 MB
ubuntu              latest   5506de2b643b  3 days ago
197.8 MB
```

### 5.4. tag

版本标签

```
docker tag ubuntu:15.10 runoob/ubuntu:v3
```

latest 标签

```
docker tag netkiller/config:10.10 netkiller/config
```

在不同仓库间打标签

```
iMac:registry neo$ docker tag 127.0.0.1:5000/netkiller/config:latest
192.168.64.2:30050/netkiller/config:latest
```

### 5.5. 保存和载入镜像

保存镜像

```
$sudo docker save -o ubuntu_14.10.tar ubuntu:14.10
```

载入镜像

```
$ sudo docker load --input ubuntu_14.10.tar  
或  
$ sudo docker load < ubuntu_14.10.tar
```

## 5.6. 删除本地镜像

```
$ sudo docker rmi ubuntu:12.04  
Untagged: ubuntu:12.04
```

强制删除所有镜像

```
docker rmi -f $(docker images -q)
```

删除 none 标签镜像

```
docker images | grep none | awk '{ print $3; }' | xargs docker rmi
```

## 5.7. history 镜像历史纪录

镜像历史纪录

```
# docker history centos:tomcat  
IMAGE          CREATED      CREATED BY  
SIZE           COMMENT  
2faf9a2d2bdc   22 hours ago /bin/sh -c #(nop)  CMD [ "catalina.sh"  
"run" ]      0 B  
8e12c1e8fd89   22 hours ago /bin/sh -c #(nop)  EXPOSE 8080/tcp
```

```

0 B
35158d8231c5      22 hours ago      /bin/sh -c #(nop) VOLUME
[/srv/tomcat/temp] 0 B
4302c5c13241      22 hours ago      /bin/sh -c #(nop) VOLUME
[/srv/tomcat/work] 0 B
53537696aa19      22 hours ago      /bin/sh -c #(nop) ADD
file:ac42f23f37092b9... 298 B
be04ba27a9ae      23 hours ago      /bin/sh -c set -x && wget -O
tomcat.tar....    8.75 MB
847be662a35f      5 days ago       /bin/sh -c #(nop) ENV
TOMCAT_ASC_URL=http... 0 B
ac6550346558      5 days ago       /bin/sh -c #(nop) ENV
TOMCAT_TGZ_URL=http... 0 B
50c12be7ca48      5 days ago       /bin/sh -c #(nop) ENV
TOMCAT_VERSION=8.5.15 0 B
89c44758e4ae      5 days ago       /bin/sh -c #(nop) ENV TOMCAT_MAJOR=8
0 B
560ad98c1b23      5 days ago       /bin/sh -c yum install -y java-1.8.0-
openj... 236 MB
befeedbb7dc7      5 days ago       /bin/sh -c #(nop) WORKDIR /srv/tomcat
0 B
c85cf394faf8      5 days ago       /bin/sh -c mkdir -p "$CATALINA_HOME"
0 B
debf78012b2c      5 days ago       /bin/sh -c #(nop) ENV
PATH=/srv/tomcat/bi... 0 B
ccc27f4f3bcf      5 days ago       /bin/sh -c #(nop) ENV
CATALINA_HOME=/srv/... 0 B
8f351964d568      6 days ago       /bin/sh -c #(nop) MAINTAINER Netkiller
<n... 0 B
3bee3060bfc8      9 days ago       /bin/sh -c #(nop) CMD ["/bin/bash"]
0 B
<missing>         9 days ago       /bin/sh -c #(nop) LABEL name=CentOS
Base ... 0 B
<missing>         9 days ago       /bin/sh -c #(nop) ADD
file:d22a9c627d1d1f3... 193 MB

```

```

docker history docker.io/mysql:5.7
docker history --no-trunc docker.io/mysql:5.7

```

```

neo@MacBook-Pro-Neo ~ % docker history docker.elastic.co/kibana/kibana:7.9.2
IMAGE          CREATED          CREATED BY
SIZE           COMMENT
ba296c26886a   4 weeks ago     /bin/sh -c #(nop) CMD
[ "/usr/local/bin/kiba... 0B
<missing>       4 weeks ago     /bin/sh -c #(nop) ENTRYPPOINT
[ "/usr/local/b... 0B
<missing>       4 weeks ago     /bin/sh -c #(nop) LABEL org.label-
schema.sc... 0B
<missing>       4 weeks ago     /bin/sh -c #(nop) USER kibana

```

```

0B
<missing>          4 weeks ago      /bin/sh -c groupadd --gid 1000 kibana &&
use...   360kB
<missing>          4 weeks ago      /bin/sh -c find / -xdev -perm -4000 -
exec ch...  484kB
<missing>          4 weeks ago      /bin/sh -c chmod g+ws /usr/share/kibana
&& f...   0B
<missing>          4 weeks ago      /bin/sh -c #(nop) COPY --
chown=1000:0file:49...  9.69kB
<missing>          4 weeks ago      /bin/sh -c #(nop) COPY --
chown=1000:0file:ea...  234B
<missing>          4 weeks ago      /bin/sh -c #(nop) ENV
PATH=/usr/share/kibana...  0B
<missing>          4 weeks ago      /bin/sh -c #(nop) ENV
ELASTIC_CONTAINER=true  0B
<missing>          4 weeks ago      /bin/sh -c ln -s /usr/share/kibana
/opt/kiba...  17B
<missing>          4 weeks ago      /bin/sh -c #(nop) WORKDIR
/usr/share/kibana  0B
<missing>          4 weeks ago      /bin/sh -c #(nop) COPY --
chown=1000:0dir:e8c...  941MB
<missing>          4 weeks ago      /bin/sh -c chmod +x /usr/local/bin/dumb-
init   54.7kB
<missing>          4 weeks ago      /bin/sh -c echo
"37f2c1f0372a45554f1b89924fb...  0B
<missing>          4 weeks ago      /bin/sh -c curl -L -o
/usr/local/bin/dumb-in...  75.2kB
<missing>          4 weeks ago      /bin/sh -c yum update -y && yum install
-y f...   31.1MB
<missing>          4 weeks ago      /bin/sh -c #(nop) EXPOSE 5601
0B
<missing>          2 months ago     /bin/sh -c #(nop) CMD ["/bin/bash"]
0B
<missing>          2 months ago     /bin/sh -c #(nop) LABEL org.label-
schema.sc...  0B
<missing>          2 months ago     /bin/sh -c #(nop) ADD
file:61908381d3142ffba...  203MB

```

## 5.8. format 用法

```
docker images --format "{{.Repository}}:{{.Tag}}" | grep ':latest'
```

## 5.9. inspect

```
[root@netkiller ~]# docker image inspect redis:latest | grep -i version
"GOSU_VERSION=1.14",
"REDIS_VERSION=7.0.4",
```

```
"DockerVersion": "20.10.12",
"GOSU_VERSION=1.14",
"REDIS_VERSION=7.0.4",
```

## 5.10. 查看镜像内容

```
docker run -it --entrypoint sh <images>
```

### 操作演示

```
[root@netkiller ~]# docker run -it --entrypoint sh nginx:latest
# find / | more
/
/bin
/bin/bash
/bin/cat
/bin/chgrp
/bin/chmod
/bin/chown
```

## 6. 容器管理

### 6.1. 查看容器

```
iMac:netkiller neo$ docker container ls
```

### 6.2. 启动与终止容器

```
$ sudo docker run ubuntu:14.10 /bin/echo 'Hello world'  
Hello world
```

进入BASH

```
$ sudo docker run -t -i ubuntu:14.10 /bin/bash  
root@f8c7b2afff14:/#
```

start / stop / restart

```
sudo docker start silly_bohr  
silly_bohr  
  
$ sudo docker stop silly_bohr  
silly_bohr  
  
$ sudo docker restart silly_bohr  
silly_bohr
```

```
[root@localhost ~]# docker container start registry
```

```
registry

[root@localhost ~]# docker ps
CONTAINER ID        IMAGE               COMMAND                  CREATED
STATUS              PORTS              NAMES
f1e57592f82a        registry:latest     "/entrypoint.sh /etc..."   8 days
ago                Up 6 seconds       0.0.0.0:5000->5000/tcp   registry

[root@localhost ~]# curl http://192.168.3.6:5000/v2/_catalog
{"repositories":[]}
```

## 守护进程运行

```
$ sudo docker run -d ubuntu:14.10 /bin/sh -c "while true; do echo hello
world; sleep 1; done"
4cdbb75eeabf3f1ea87bec91accd5211639d0895e94ab94ffa1d55fb7f62e2a
```

通过 docker ps 命令来查看容器信息

```
$ sudo docker ps
CONTAINER ID        IMAGE               COMMAND                  CREATED
STATUS              PORTS              NAMES
4cdbb75eeabf        ubuntu:14.10      "/bin/sh -c 'while t    30
seconds ago         Up 28 seconds      drunk_rosalind
```

要获取容器的输出信息，可以通过 docker logs 命令。

```
$ sudo docker logs insane_babbage
```

注意：守护进程在后台运行，所以无输出，只能通过docker logs 命令查看

## 6.3. 进入容器

```
$ sudo docker run -idt ubuntu:14.10
793f9805620d7e10564e0778c388640cb73b6a1aecd63bf468904d72a4f219f2

$ sudo docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED            STATUS              NAMES
793f9805620d        ubuntu:14.10       "/bin/bash"        5 seconds ago      Up 4 seconds     mad_elion

$ sudo docker attach mad_elion
root@793f9805620d:/# ls
bin  boot  dev  etc  home  lib  lib64  media  mnt  opt  proc  root  run
sbin  srv  sys  tmp  usr  var
```

## 6.4. 运行容器内的命令

```
neo@MacBook-Pro-Neo ~ % docker exec prometheus id
uid=65534(nobody) gid=65534(nogroup)
```

## 6.5. 导出和导入容器

### Ubuntu

```
$ sudo docker export 7691a814370e > ubuntu.tar
```

```
<![CDATA[
$ cat ubuntu.tar | sudo docker import - test/ubuntu:v1.0
```

指定 URL 或者某个目录来导入，例如

```
$ sudo docker import http://example.com/exampleimage.tgz
example/imagerepo
```

## Mac 导出与导入

导出

```
iMac:tmp neo$ docker export registry -o registry.tar
```

导入

```
iMac:tmp neo$ docker import registry.tar  
sha256:1678c838115696f9540f168fe117ea81715b6b676497307e65d15d1ac10d9a11
```

指定 [REPOSITORY[:TAG]]

```
iMac:tmp neo$ docker import registry.tar registry:latest  
sha256:7b76bd807a47dcc60e41bf2f8268ecf69906bb14c2ebaa348c4c15aac716b878  
  
iMac:tmp neo$ docker images registry  
REPOSITORY          TAG           IMAGE ID      CREATED  
SIZE  
registry            latest        7b76bd807a47   11 seconds  
ago     26.2MB
```

## 6.6. 停止所有容器

杀死所有正在运行的容器

```
docker kill $(docker ps -a -q)
```

## 信号处理

--signal, -s 向容器发送信号

发送一个SIGHUP信号

```
$ docker kill -s=SIGHUP my_container
```

你可以通过名字或数字指定自定义信号，SIG前缀是可选的，例如下面的命令是等价的：

```
$ docker kill -s=SIGHUP my_container
$ docker kill -s=HUP my_container
$ docker kill -s=1 my_container
```

## 6.7. 删除容器

使用 docker rm 来删除一个处于终止状态的容器。

```
$ sudo docker ps -a
CONTAINER ID        IMAGE               COMMAND                  CREATED
STATUS              PORTS              NAMES
f8c7b2afff14        ubuntu:14.10       "/bin/bash"
minutes ago         Exited (0) 2 minutes ago
agitated_fermat
0abd2e5fc251        ubuntu:14.10       "/bin/echo 'Hello wo
minutes ago         Exited (0) 15 minutes ago
clever_kowalevski

$ sudo docker rm clever_kowalevski
clever_kowalevski

$ sudo docker ps -a
CONTAINER ID        IMAGE               COMMAND                  CREATED
STATUS              PORTS              NAMES
f8c7b2afff14        ubuntu:14.10       "/bin/bash"            16 minutes
ago                Exited (0) 5 minutes ago
agitated_fermat
```

```
$ docker rm  
719f98391ecf1d6f1f153ffea1bbd84cd2dc9cf6d31d5a4f348c60d98392814c
```

删除所有已经停止的容器

```
docker rm $(docker ps -a -q)
```

## 6.8. log-driver

日志发送到 fluentd

```
docker run --log-driver=fluentd --log-opt fluentd-  
address=192.168.2.5:24220 ubuntu echo "Hello world"
```

## 6.9. 操作系统

设置环境变量

```
iMac:welcome neo$ docker run 127.0.0.1:5000/netkiller/welcome -e  
JAVA_OPTS="-server -Xms512m -Xmx4096m"
```

/etc/hosts 配置

```
# docker run --add-host=docker:10.180.0.1 --rm -it debian
```

向 /etc/hosts 文件内添加主机名

```
docker run -it --add-host=db.netkiller.cn:172.16.18.80 ubuntu cat /etc/hosts
```

## sysctl

```
$ docker run --sysctl net.ipv4.ip_forward=1 someimage
```

```
docker run -itd --restart=always --net=host \
--name=centos01 --hostname=centos01 \
--sysctl kernel.msgmnb=13107200 \
--sysctl kernel.msgmni=256 \
--sysctl kernel.msgmax=65536 \
--sysctl kernel.shmmmax=69719476736 \
--sysctl kernel.sem='500 256000 250 1024' \
-v /mnt/ssd:/var/lib/www \
centos:latest /bin/bash

docker exec centos01 sysctl -a |grep -E \
'kernel.msgmnb|kernel.msgmni|kernel.msgmax|kernel.shmmmax|kernel.sem'
```

## ulimits

查看 ulimit 设置

```
$ docker run --ulimit nofile=1024:1024 --rm debian sh -c "ulimit -n"
```

```
$ docker run -it --ulimit as=1024 fedora /bin/bash
$ docker run -d -u daemon --ulimit nproc=3 busybox top
```

```
docker run -d --ulimit nofile=20480:40960 nproc=1024:2048 nginx
```

## 6.10. 查看容器内运行的进程

```
neo@MacBook-Pro-Neo ~ % docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED            STATUS              PORTS
NAMES
a6e33697e4bb      docker.elastic.co/elasticsearch/elasticsearch:7.9.2
"/tini -- /usr/local..."   2 minutes ago    Up 2 minutes
9200/tcp, 9300/tcp          es02
598a6e61d4fc      docker.elastic.co/kibana/kibana:7.9.2
"/usr/local/bin/dumb..."   2 minutes ago    Up 2 minutes
0.0.0.0:5601->5601/tcp          kibana
bc125a658981      docker.elastic.co/elasticsearch/elasticsearch:7.9.2
"/tini -- /usr/local..."   2 minutes ago    Up 2 minutes
9200/tcp, 9300/tcp          es03
d027503bee4b      docker.elastic.co/elasticsearch/elasticsearch:7.9.2
"/tini -- /usr/local..."   2 minutes ago    Up 2 minutes
0.0.0.0:9200->9200/tcp, 9300/tcp      elasticsearch

neo@MacBook-Pro-Neo ~ % docker top 598a6e61d4fc
PID           USER           TIME           COMMAND
3077          1000          0:00
/usr/local/bin/dumb-init -- /usr/local/bin/kibana-docker
3285          1000          1:58
/usr/share/kibana/bin/.../node/bin/node /usr/share/kibana/bin/.../src/cli
--cpu.cgroup.path.override=/ --cpuacct.cgroup.path.override=/
```

## 6.11. 更新容器资源配置

```
neo@MacBook-Pro-Neo ~ % docker update kibana --cpus 1
```

```
kibana
```

## 6.12. 查看容器的退出状态

```
neo@MacBook-Pro-Neo ~ % docker wait a6e33697e4bb  
0
```

## 6.13. 暂停与恢复容器

暂停容器运行

```
docker pause a6e33697e4bb
```

恢复容器运行

```
docker unpause a6e33697e4bb
```

## 6.14. 对比容器的变化

查看容器启动后，修改了镜像中哪些问题

```
neo@MacBook-Pro-Neo ~ % docker diff a6e33697e4bb  
C /tmp  
A /tmp/elasticsearch-14495251404334864644  
A /tmp/hspfdata_elasticsearch  
A /tmp/hspfdata_elasticsearch/6  
C /usr  
C /usr/share  
C /usr/share/elasticsearch  
C /usr/share/elasticsearch/config  
A /usr/share/elasticsearch/config/elasticsearch.keystore
```

```
A /usr/share/elasticsearch/.cache  
A /usr/share/elasticsearch/.cache/JNA  
A /usr/share/elasticsearch/.cache/JNA/temp  
C /usr/share/elasticsearch/logs  
A /usr/share/elasticsearch/logs/gc.log  
A /usr/share/elasticsearch/logs/gc.log.00
```

## 6.15. 查看容器状态

```
neo@MacBook-Pro-Neo ~ % docker stats  
CONTAINER ID      NAME          CPU %     MEM USAGE /  
LIMIT      MEM %      NET I/O          BLOCK I/O  
PIDS  
a6e33697e4bb      es02          0.68%    894.2MiB /  
3.848GiB   22.69%          13.9MB / 6.95MB    98.9MB / 3.88MB  
77  
598a6e61d4fc      kibana         0.95%    462.8MiB /  
3.848GiB   11.74%          718kB / 13MB      409MB / 4.1kB  
12  
bc125a658981      es03          2.67%    889.9MiB /  
3.848GiB   22.58%          1.76MB / 5.79MB    48.5MB / 3.09MB  
71  
d027503bee4b      elasticsearch  2.75%    928.4MiB /  
3.848GiB   23.56%          24MB / 14.7MB     139MB / 8.57MB  
75
```

## 6.16. 重启容器

--time, -t 10 停止容器之前需要等待的时间(秒)

```
$ docker restart [options] container [container...]
```

## 6.17. DNS

host.docker.internal

gateway.docker.internal

## 7. 卷管理

### 7.1. 列出卷

```
docker volume ls
```

```
# docker volume ls
DRIVER          VOLUME NAME
local
dbac41b6de88c75d2932d5949367b17f347f482977d508195375dbc71518ab27
```

### 7.2. 创建卷

```
# docker volume create --name WebVolume1
WebVolume1
```

```
# docker volume ls
DRIVER          VOLUME NAME
local
local
WebVolume1
dbac41b6de88c75d2932d5949367b17f347f482977d508195375dbc71518ab27
```

### 7.3. 挂载镜像

```
# docker run -ti --rm -v WebVolume1:/www ubuntu
# docker run -ti --rm -v WebVolume1:/www docker.io/centos:7
```

查看卷的挂载情况

```
# df | grep /www
/dev/vda1      20510332 7943940 11501484 41% /www
```

## 创建测试文件

```
# mkdir -p /www/netkiller.cn/www.netkiller.cn
# echo Helloworld > /www/netkiller.cn/www.netkiller.cn/index.html
# cat /www/netkiller.cn/www.netkiller.cn/index.html
Helloworld
# exit
exit
```

## 7.4. 检查卷

```
# docker volume inspect WebVolume1
[
  {
    "Driver": "local",
    "Labels": {},
    "Mountpoint": "/var/lib/docker/volumes/WebVolume1/_data",
    "Name": "WebVolume1",
    "Options": {},
    "Scope": "local"
  }
]
```

## 7.5. 删除卷

```
# docker volume create AppVolume1
# docker volume rm AppVolume1
```

## 7.6. 销毁所有未使用的卷

```
# docker volume prune
WARNING! This will remove all volumes not used by at least one container.
Are you sure you want to continue? [y/N] y
Deleted Volumes:
WebVolume1
3fd379f8c2cf8727d2e83e84e434ea1f122016957bd7cf78a0f05b6e5a69cf2b
app

Total reclaimed space: 11 B
```

## 7.7. 在多个容器间共享卷

容器一

```
# docker run -ti --name=Container1 -v DataVolume1:/opt/data ubuntu
```

容器二

```
# docker run -ti --name=Container2 --volumes-from Container1 ubuntu
```

进入容器一中查看数据

```
# docker start -ai Container1
```

容器三，挂住只读卷

```
# docker run -ti --name=Container3 --volumes-from Container2:ro ubuntu
```

删除上面三个测试容易和卷

```
# docker rm Container1 Container2 Container3  
# docker volume rm DataVolume1
```

## 7.8. 容器绑定本地文件系统

**Bind mount a volume (default [])**

```
# docker run -it --name mycentos1 -v /www:/tmp/test docker.io/centos:7 /bin/bash
# docker run -d -v ~/logs:/var/log/nginx -p 80:80 -i nginx
```

## 7.9. 只读权限

/etc/redis/redis.conf:/etc/redis/redis.conf:ro 表示只读权限

```
docker run \
-p 6379:6379 \
-v /var/lib/redis:/data \
-v /etc/redis/redis.conf:/etc/redis/redis.conf:ro \
--privileged=true \
--name redis \
-d docker.io/redis:latest redis-server /etc/redis/redis.conf
```

## 8. Docker 网络管理

### 8.1. docker0 IP地址

查看 docker0 的IP地址

```
root@production:~# ifconfig docker0
docker0    Link encap:Ethernet  HWaddr 02:42:ad:68:6b:cf
           inet addr:172.18.0.1  Bcast:172.18.255.255
Mask:255.255.0.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)   TX bytes:0 (0.0 B)
```

修改 docker0 的IP地址

```
root@production:~# vim /etc/docker/daemon.json
root@production:~# cat /etc/docker/daemon.json
{
  "bip": "172.100.10.1/24"
}
root@production:~# systemctl restart docker

root@production:~# ifconfig docker0
docker0    Link encap:Ethernet  HWaddr 02:42:ad:68:6b:cf
           inet addr:172.100.10.1  Bcast:172.100.10.255
Mask:255.255.255.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)   TX bytes:0 (0.0 B)
```

## 提示

曾经遇到一个案例，阿里云使用172.18.0.0/16作为RDS内网IP地址，ECS安装了docker后无法链接RDS属于，因为docker修改了路由表，将docker换到其他网段后工作正常。

## 8.2. 容器指定固定IP地址

```
docker run -d --privileged -p 9000:9000 --ip 192.168.5.2 \
--restart=always \
-v /var/run/docker.sock:/var/run/docker.sock \
-v /opt/portainer:/data \
portainer/portainer
```

## 8.3. 创建子网

```
docker network create --subnet=172.32.0.0/24 web
```

## 8.4. 创建 overlay 网络

```
docker network create \
--driver=overlay \
--subnet=172.12.0.0/16 \
--ip-range=172.12.0.0/16 \
--gateway=172.12.0.1 \
--attachable \
test
```

```
iMac:redis neo$ docker network ls
```

NETWORK ID	NAME	DRIVER
SCOPE		
786efe30f42d local	bridge	bridge
51e2b21d7daa local	docker_gwbridge	bridge
96ba0de26cd2 local	host	host
7r7k9robn0uu swarm	ingress	overlay
cbf078a5f121 local	none	null
d851mrlkludv swarm	redis_default	overlay
q0h9awx86ef4 swarm	registry_default	overlay
cf585ea9ceb4 local	registry_default	bridge
gvcz5y66ovrl swarm	test	overlay

查看详细信息

```
iMac:redis neo$ docker network inspect test
[
  {
    "Name": "test",
    "Id": "gvcz5y66ovrlqfaxb02zx026t",
    "Created": "2020-09-26T14:07:49.037581155Z",
    "Scope": "swarm",
    "Driver": "overlay",
    "EnableIPv6": false,
    "IPAM": {
      "Driver": "default",
      "Options": null,
      "Config": [
        {
          "Subnet": "172.12.0.0/16",
          "IPRange": "172.12.0.0/16",
          "Gateway": "172.12.0.1"
        }
      ]
    }
  }
]
```

```
        ],
    },
    "Internal": false,
    "Attachable": true,
    "Ingress": false,
    "ConfigFrom": {
        "Network": ""
    },
    "ConfigOnly": false,
    "Containers": null,
    "Options": {
        "com.docker.network.driver.overlay.vxlanid_list": "4104"
    },
    "Labels": null
}
]
```

## 8.5. 网络命令空间

```
[root@localhost ~]# docker inspect --format="{{ .State.Pid }}"
b279738af403
2180

[root@localhost ~]# mkdir -p /var/run/netns
[root@localhost ~]# ln -s /proc/2180/ns/net /var/run/netns/2180

[root@localhost ~]# ip netns exec 2180 ip route
default via 192.168.49.1 dev eth0
172.17.0.0/16 dev docker0 proto kernel scope link src 172.17.0.1
192.168.30.0/24 via 192.168.49.1 dev eth0
192.168.49.0/24 dev eth0 proto kernel scope link src
192.168.49.2
```

## 8.6. flannel 网络配置

```
[root@master ~]# ip -d link show flannel.1
11: flannel.1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1450 qdisc noqueue state UNKNOWN mode DEFAULT group default
    link/ether c2:51:5c:09:4e:18 brd ff:ff:ff:ff:ff:ff
    promiscuity 0 minmtu 68 maxmtu 65535
    vxlan id 1 local 172.18.200.5 dev enp3s0 srcport 0 0 dstport 8472 nolearning ttl auto ageing 300 udpcsum noudp6zerocsumtx noudp6zerocsumrx addrgenmode eui64 numtxqueues 1 numrxqueues 1 gso_max_size 64000 gso_max_segs 64

[root@master ~]# cat /run/flannel/subnet.env
FLANNEL_NETWORK=10.42.0.0/16
FLANNEL_SUBNET=10.42.0.1/24
FLANNEL_MTU=1450
FLANNEL_IPMASQ=true

[root@master ~]# dockerd --bip=$FLANNEL_SUBNET --
mtu=$FLANNEL_MTU
```

```
[root@agent-1 ~]# ip -d link show flannel.1
5: flannel.1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1450 qdisc noqueue state UNKNOWN mode DEFAULT group default
    link/ether 56:e0:f3:da:d5:c4 brd ff:ff:ff:ff:ff:ff
    promiscuity 0 minmtu 68 maxmtu 65535
    vxlan id 1 local 172.18.200.51 dev enp3s0 srcport 0 0
    dstport 8472 nolearning ttl auto ageing 300 udpcsum
    noudp6zerocsumtx noudp6zerocsumrx addrgenmode eui64 numtxqueues 1 numrxqueues 1 gso_max_size 64000 gso_max_segs 64

[root@agent-1 ~]# cat /run/flannel/subnet.env
FLANNEL_NETWORK=10.42.0.0/16
FLANNEL_SUBNET=10.42.1.1/24
FLANNEL_MTU=1450
FLANNEL_IPMASQ=true

[root@agent-1 ~]# cat /etc/docker/daemon.json
{
    "bip": "10.42.1.254/24",
```

```
        "ip-masq":true,
        "mtu":1472,

    "registry-mirrors": [
        "https://docker.mirrors.ustc.edu.cn/"
    ]
}

[root@agent-1 ~]# cat /usr/lib/systemd/system/docker.service
[Unit]
Description=Docker Application Container Engine
Documentation=https://docs.docker.com
After=network-online.target docker.socket firewalld.service
containerd.service
Wants=network-online.target
Requires=docker.socket containerd.service

[Service]
Type=notify
EnvironmentFile=/run/flannel/subnet.env
# the default is not to use systemd for cgroups because the
delegate issues still
# exists and systemd currently does not support the cgroup
feature set required
# for containers run by docker
ExecStart=/usr/bin/dockerd -H fd:// --
containerd=/run/containerd/containerd.sock --bip=$FLANNEL_SUBNET
--mtu=$FLANNEL_MTU
ExecReload=/bin/kill -s HUP $MAINPID
TimeoutSec=0
RestartSec=2
Restart=always

# Note that StartLimit* options were moved from "Service" to
[Unit] in systemd 229.
# Both the old, and new location are accepted by systemd 229 and
up, so using the old location
# to make them work for either version of systemd.
StartLimitBurst=3

# Note that StartLimitInterval was renamed to
StartLimitIntervalSec in systemd 230.
# Both the old, and new name are accepted by systemd 230 and up,
so using the old name to make
# this option work for either version of systemd.
StartLimitInterval=60s
```

```

# Having non-zero Limit*s causes performance problems due to
accounting overhead
# in the kernel. We recommend using cgroups to do container-
local accounting.
LimitNOFILE=infinity
LimitNPROC=infinity
LimitCORE=infinity

# Comment TasksMax if your systemd version does not support it.
# Only systemd 226 and above support this option.
TasksMax=infinity

# set delegate yes so that systemd does not reset the cgroups of
docker containers
Delegate=yes

# kill only the docker process, not all processes in the cgroup
KillMode=process
OOMScoreAdjust=-500

[Install]
WantedBy=multi-user.target

```

```

[root@master ~]# docker run -it --name test busybox /bin/sh
/ # ifconfig
eth0      Link encap:Ethernet  HWaddr 02:42:0A:2A:01:01
          inet addr:10.42.0.2  Bcast:10.42.1.255
Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1472  Metric:1
          RX packets:12 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:1016 (1016.0 B)  TX bytes:0 (0.0 B)

lo       Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

```

```
[root@agent-1 ~]# docker run -it --name test busybox /bin/sh
/ # ifconfig
eth0      Link encap:Ethernet  HWaddr 02:42:0A:2A:01:01
          inet addr:10.42.1.2  Bcast:10.42.1.255
Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1472  Metric:1
          RX packets:12 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:1016 (1016.0 B)  TX bytes:0 (0.0 B)

lo       Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

/ # ping 10.42.0.2
```

## 9. 日志管理

### 9.1. 查看默认驱动

查看默认驱动 docker info --format '{{.LoggingDriver}}'

```
[root@testing ~]# docker info --format '{{.LoggingDriver}}'  
json-file
```

查看容器日志配置

```
[root@testing ~]# docker inspect -f  
'{{.HostConfig.LogConfig.Type}}' api  
fluentd
```

### 9.2. Fluentd 配置

在 Docker 中安装 Fluentd

准备 test.conf 文件

```
<source>  
  @type forward  
</source>  
  
<match **>  
  @type stdout  
</match>
```

## 启动 fluentd 接收日志

```
$ docker run -it -p 24224:24224 -v  
/path/to/conf/test.conf:/fluentd/etc/test.conf -e  
FLUENTD_CONF=test.conf fluent/fluentd:latest
```

### 9.3. Docker 配置

#### 运行你的程序

```
$ docker run --log-driver=fluentd your/application
```

#### 如果是远程主机使用 fluentd-address 参数

```
docker run --log-driver=fluentd --log-opt fluentd-  
address=fluentdhost:24224  
docker run --log-driver=fluentd --log-opt fluentd-  
address=tcp://fluentdhost:24224  
docker run --log-driver=fluentd --log-opt fluentd-  
address=unix:///path/to/fluentd.sock
```

#### 以 Nginx 为例：

```
$ docker run -d \  
--log-driver=fluentd \  
--log-opt fluentd-address=10.10.0.1:24224 \  
--log-opt tag="docker.{{.Name}}" \  
nginx
```

## 9.4. docker-compose 编排

fluentd.conf

```
<source>
  @type forward
</source>

<match **>
  @type file
  path          /var/log/fluentd/${tag}
  append        true
  <format>
    @type      single_value
    message_key log
  </format>
  <buffer tag,time>
    @type      file
    timekey    1d
    timekey_wait 10m
    flush_mode   interval
    flush_interval 30s
  </buffer>
</match>
```

```
version: '3.9'
services:
  fluentd:
    image: fluent/fluentd:latest
    container_name: fluentd
    hostname: fluentd.netkiller.cn
    restart: always
    volumes:
      -
        /opt/netkiller.cn/ops.netkiller.cn/fluentd/conf:/fluentd/etc
```

```

    - /var/log/fluentd:/var/log/fluentd
  ports:
    - "24224:24224"
    - "24224:24224/udp"
  environment:
    FLUENTD_CONF: fluentd.conf

api:
  image: openjdk:8
  container_name: api
  restart: always
  hostname: api.netkiller.cn
  extra_hosts:
    - www.netkiller.cn:139.186.170.130
  environment:
    TZ: Asia/Shanghai
    JAVA_OPTS: -Xms1024m -Xmx4096m -XX:MetaspaceSize=128m -
XX:MaxMetaspaceSize=512m
  ports:
    - 8088:8080
  volumes:
    - /opt/netkiller.cn/api.netkiller.cn:/app
    - /opt/netkiller.cn/api.netkiller.cn/logs:/app/logs
  working_dir: /app
  #links:
  # - fluentd
  logging:
    driver: fluentd
    options:
      fluentd-address: 192.168.30.10:24224
      tag: httpd.access
  entrypoint: java -jar /app/api.netkiller.cn.jar
  command:
    --spring.profiles.active=test
    --server.port=8080

```

## 9.5. 将日志输出到 /dev/stdout 和 /dev/stderr

```
# ls -l /var/log/nginx/
total 0
lrwxrwxrwx    1 root      root           11 Jan 31  2022
```

```
access.log -> /dev/stdout
lrxwxrwxrwx    1 root      root           11 Jan 31  2022
error.log -> /dev/stderr
```

# 10. Dockerfile

## 10.1. 基于 Dockerfile 创建镜像

为什么要自己创建镜像呢？因为官方提供的镜像无法满足我们的需求，例如 nginx 镜像你会发现 ps, top 等等很多命令缺失。

### 创建 Dockerfile 文件

需求基于centos7镜像创建nginx stable最新版本镜像

```
#####
# Dockerfile to build Nginx container
# Based on centos7
#####

FROM centos:latest

MAINTAINER Netkiller <netkiller@msn.com>

# Install EPEL
RUN yum install -y epel-release && yum clean all

# Update RPM Packages
RUN yum -y update

# Install Nginx
RUN rpm -ivh http://nginx.org/packages/centos/7/noarch/RPMS/nginx-release-centos-7-0.el7.ngx.noarch.rpm
RUN yum install -y nginx
RUN yum clean all

# forward request and error logs to docker log collector
RUN ln -sf /dev/stdout /var/log/nginx/access.log
RUN ln -sf /dev/stderr /var/log/nginx/error.log

# be backwards compatible with pre-official images
#RUN ln -sf ../share/nginx /usr/local/nginx

# prepare container

# add startup script
#ADD startup.sh /startup.sh
#RUN chmod 755 /startup.sh

VOLUME [ "/etc/nginx" ]
VOLUME [ "/usr/share/nginx/html" ]
VOLUME [ "/var/www" ]

EXPOSE 80 443
```

```
CMD [ "nginx", "-g", "daemon off;" ]
```

## 创建镜像

```
# docker build -t "centos:nginx" .
Sending build context to Docker daemon 3.072 kB
Step 1/14 : FROM centos:latest
--> 3bee3060bfc8
Step 2/14 : MAINTAINER Netkiller <netkiller@msn.com>
--> Using cache
--> 8f351964d568
Step 3/14 : RUN yum install -y epel-release && yum clean all
--> Using cache
--> bf86eff77ff3
Step 4/14 : RUN yum -y update
--> Using cache
--> 4915172ac4f3
Step 5/14 : RUN rpm -ivh http://nginx.org/packages/centos/7/noarch/RPMS/nginx-
release-centos-7-0.el7.ngx.noarch.rpm
--> Using cache
--> 4a919bd141c9
Step 6/14 : RUN yum install -y nginx
--> Using cache
--> 2718221eab8c
Step 7/14 : RUN yum clean all
--> Using cache
--> 62231a5f1d76
Step 8/14 : RUN ln -sf /dev/stdout /var/log/nginx/access.log
--> Using cache
--> 38be8f0cc782
Step 9/14 : RUN ln -sf /dev/stderr /var/log/nginx/error.log
--> Using cache
--> bbf3a468d24f
Step 10/14 : VOLUME /etc/nginx
--> Using cache
--> 919292c7ce04
Step 11/14 : VOLUME /usr/share/nginx/html
--> Using cache
--> c2aeb8ed3c1c
Step 12/14 : VOLUME /var/www
--> Using cache
--> 31849cb8a9d0
Step 13/14 : EXPOSE 80 443
--> Using cache
--> 0e3d3b4a215b
Step 14/14 : CMD nginx -g daemon off;
--> Using cache
--> d5f21e409690
Successfully built d5f21e409690
```

## 查看镜像

```
# docker image ls
REPOSITORY          TAG      IMAGE ID      CREATED
SIZE
centos              nginx   d5f21e409690  4 minutes ago
364 MB
centos              latest   3bee3060bfc8  2 days ago
193 MB
nginx               latest   958a7ae9e569  8 days ago
109 MB
redis               latest   a858478874d1  2 weeks ago
184 MB
```

## 运行镜像

```
# docker run --name my-centos-nginx -d centos:nginx
ecf342ddd66d1d5f3d28c583ec852c05903ef4813fcb75295c907a6b578dea3d

# docker ps
CONTAINER ID        IMAGE           COMMAND            CREATED
STATUS             PORTS           NAMES
ecf342ddd66d      centos:nginx    "nginx -g 'daemon ..."   23 seconds ago
Up 23 seconds      80/tcp, 443/tcp   my-centos-nginx
0df3b275bb03      nginx          "nginx -g 'daemon ..."   6 hours ago
Up 6 hours         80/tcp          my-nginx
1c4540d8617f      redis           "docker-entrypoint..."  2 days ago
Up 2 days          0.0.0.0:6379->6379/tcp  my-redis
```

## 测试 Nginx

```
[root@netkiller]~/docker/nginx# docker exec -it my-centos-nginx /bin/bash

[root@netkiller-docker /]# ps ax
 PID TTY      STAT      TIME COMMAND
 1 ?        Ss      0:00 nginx: master process nginx -g daemon off;
 7 ?        S      0:00 nginx: worker process
 8 ?        Ss      0:00 /bin/bash
22 ?        R+      0:00 ps ax

[root@netkiller-docker /]# curl http://localhost
```

```
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
    body {
        width: 35em;
        margin: 0 auto;
        font-family: Tahoma, Verdana, Arial, sans-serif;
    }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
```

## 提交镜像

```
# docker commit my-centos-nginx netkiller/centos:nginx
sha256:9ea1851b1c9f04aa3168977f666337223d09e20983f7a2c2328e15132a03d224
```

```
# docker push netkiller/centos:nginx
The push refers to a repository [docker.io/netkiller/centos]
16916856eaaa: Pushed
6172d61b45f1: Pushed
db323af550f0: Pushed
232df2cfcd38f: Pushed
c247a550215b: Pushed
3b5451d7989c: Pushed
e3a6f1af6a7a: Pushed
9e3cea652b37: Pushed
dc1e2dc7b6: Mounted from library/centos
nginx: digest:
sha256:ad9bd1ae3a3e17dac70f32afc14baf90932949d3eaa8bebbe907726aca3ea336 size:
2205
```

## 10.2. 基于 Alpine 制作镜像

获取最新镜像

```
root@netkiller ~# docker pull alpine:latest
```

运行镜像，看看这个镜像，在里面模拟一次执行

```
root@netkiller ~# docker run --rm -it --name=alpine --entrypoint=sh  
alpine:latest
```

进入容器，修改apk库的镜像

```
root@netkiller ~# docker run --rm -it --name=alpine --entrypoint=sh  
alpine:latest  
  
sed 's/dl-cdn.alpinelinux.org/mirrors.aliyun.com/g' -i /etc/apk/repositories  
apk update  
apk add python3
```

```
FROM python:3-alpine  
MAINTAINER netkiller "netkiller@msn.com"  
  
RUN echo https://mirrors.aliyun.com/alpine/latest-stable/main/ >  
/etc/apk/repositories  
RUN pip install --no-cache-dir flask && pip3 install python-jenkins  
RUN pip install --no-cache-dir netkiller-devops --upgrade -i  
https://pypi.tuna.tsinghua.edu.cn/simple  
RUN mkdir -p /data  
  
ADD ./ /data  
  
RUN chmod +x /data/devops  
RUN rm -rf /var/cache/apk/*  
  
WORKDIR /data  
  
EXPOSE 8080
```

```
CMD [ "python3", "app.py" ]
```

### 10.3. Dockerfile 缺失的工具

工作中我们常常发现官方镜像裁剪的面目全非，里面缺失很多常用工具，这种情况给我们工作带来诸多不便。

#### Debian/Ubuntu 镜像

切换镜像

<https://mirrors.tuna.tsinghua.edu.cn/help/debian/>

```
cat > /etc/apt/sources.list <<-EOF

deb https://mirrors.tuna.tsinghua.edu.cn/debian/ bullseye main contrib non-free
# deb-src https://mirrors.tuna.tsinghua.edu.cn/debian/ bullseye main contrib
non-free
deb https://mirrors.tuna.tsinghua.edu.cn/debian/ bullseye-updates main contrib
non-free
# deb-src https://mirrors.tuna.tsinghua.edu.cn/debian/ bullseye-updates main
contrib non-free

deb https://mirrors.tuna.tsinghua.edu.cn/debian/ bullseye-backports main contrib
non-free
# deb-src https://mirrors.tuna.tsinghua.edu.cn/debian/ bullseye-backports main
contrib non-free

deb https://mirrors.tuna.tsinghua.edu.cn/debian-security bullseye-security main
contrib non-free
# deb-src https://mirrors.tuna.tsinghua.edu.cn/debian-security bullseye-security
main contrib non-free

EOF
```

ps,top 等系统工具

```
apt update -y && apt install -y procps
```

ping

```
apt install iutils-ping
```

telnet

```
apt install -y telnet
```

ip, ss

```
apt install -y iproute2
```

ifconfig, netstat

```
apt install -y net-tools
```

dig

```
apt install -y dnsutils
```

## CentOS

psmisc 里面包含 ps, top 等命令

```
dnf install -y bzip2 tree psmisc \
telnet wget rsync vim-enhanced \
net-tools bind-utils
```

nslookup

```
dnf install -y bind-utils
```

```
dnf install -y net-tools
```

## alpine

添加 apk 仓库

```
FROM python:3.9-alpine
MAINTAINER netkiller "netkiller@msn.com"

RUN echo https://mirrors.aliyun.com/alpine/latest-stable/main/ >
/etc/apk/repositories
RUN pip3 install flask && pip3 install python-jenkins
RUN mkdir -p /data

ADD ./ /data

RUN chmod +x /data/devops
RUN rm -rf /var/cache/apk/*
WORKDIR /data

EXPOSE 8080

CMD [ "python3", "app.py" ]
```

## 10.4. Dockerfile 语法

### COPY

跨容器拷贝

```
FROM demo/test:latest as netkiller

MAINTAINER Netkiller <netkiller@msn.com>

RUN mkdir /www

COPY some/path/to/ /www/
```

```
FROM nginx:1.13-alpine

RUN rm -rf /usr/share/nginx/html/*
COPY --from=netkiller /www/ /usr/share/nginx/html/
```

--from 参数

```
# Install the base requirements for the app.
# This stage is to support development.
FROM python:alpine AS base
WORKDIR /app
COPY requirements.txt .
RUN pip install -r requirements.txt

# Run tests to validate app
FROM node:12-alpine AS app-base
WORKDIR /app
COPY app/package.json app/yarn.lock ./
RUN yarn install
COPY app/spec ./spec
COPY app/src ./src
RUN yarn test

# Clear out the node_modules and create the zip
FROM app-base AS app-zip-creator
RUN rm -rf node_modules && \
    apk add zip && \
    zip -r /app.zip /app

# Dev-ready container - actual files will be mounted in
FROM base AS dev
CMD ["mkdocs", "serve", "-a", "0.0.0.0:8000"]

# Do the actual build of the mkdocs site
FROM base AS build
COPY . .
RUN mkdocs build

# Extract the static content from the build
# and use a nginx image to serve the content
FROM nginx:alpine
COPY --from=app-zip-creator /app.zip /usr/share/nginx/html/assets/app.zip
COPY --from=build /app/site /usr/share/nginx/html
```

## EXPOSE

EXPOSE 是声明端口，容器内运行的程序使用了什么端口

```
EXPOSE <端口1> [<端口2>...]
```

## ENTRYPOINT

从命令行传递参数给容器

```
FROM ubuntu
ENTRYPOINT [ "top", "-b" ]
```

运行下面的命令：

```
$ docker run --rm test1 -c
```

实际 Docker 内部

```
top -b -c
```

ENTRYPOINT 与 CMD 组合

```
FROM ubuntu
ENTRYPOINT [ "top", "-b" ]
CMD [ "-c" ]
```

docker-entrypoint.sh 文件

```
ENTRYPOINT [ "docker-entrypoint.sh" ]
```

你不能写成

```
ENTRYPOINT docker-entrypoint.sh
```

ENTRYPOINT docker-entrypoint.sh 会使用 sh -c 执行

```
"/bin/sh -c /srv/docker-entrypoint.sh /srv/rocketmq/bin/mqnamesrv"
```

而我们需要的是

```
/srv/docker-entrypoint.sh /srv/rocketmq/bin/mqnamesrv
```

所以需要写成 ENTRYPOINT ["docker-entrypoint.sh"]

## 11. 仓库

### 11.1. Docker 官方仓库

登陆仓库

登录

```
$ sudo docker login
Username: netkiller
Password:
Email: netkiller@msn.com
Login Succeeded
```

获取镜像

```
docker pull ubuntu:14.04
```

上传镜像

```
docker tag friendlyhello username/repository:tag
docker push username/repository:tag
```

### 11.2. 私有仓库

搭建私有仓库

搭建私有仓库只需两步

```
docker pull registry
docker run -d -p 5000:5000 -v /opt/registry:/var/lib/registry --name
registry registry
```

## 操作演示

```
neo@ubuntu:~$ docker pull registry
Using default tag: latest
latest: Pulling from library/registry
169185f82c45: Pull complete
046e2d030894: Pull complete
188836fddeeb: Pull complete
832744537747: Pull complete
7ceea07e80be: Pull complete
Digest:
sha256:870474507964d8e7d8c3b53bcfa738e3356d2747a42adad26d0d81ef4479eb1b
Status: Downloaded newer image for registry:latest

neo@ubuntu:~$ docker run -d -p 5000:5000 -v /opt/registry:/tmp/registry
registry
38a6d3b5e18e378b7765fa00374426db3a06c64f4b9219a1f85dc42a6a66ef28

neo@ubuntu:~$ docker ps | grep registry
38a6d3b5e18e      registry                  "/entrypoint.sh /etc..."   35
seconds ago        Up 33 seconds            0.0.0.0:5000->5000/tcp
```

设置允许http协议访问，有两种方式，一种是修改 /etc/docker/daemon.json并添加“insecure-registries”项

```
{
  "registry-mirrors": [ "https://registry.docker-cn.com" ],
  "insecure-registries": [ "127.0.0.1:5000" ]
}
```

另一种方式是修改 /etc/default/docker 中加入下面内容

```
neo@ubuntu:~$ sudo vim /etc/default/docker
```

```
DOCKER_OPTS="--insecure-registry 0.0.0.0:5000"
```

修改 /lib/systemd/system/docker.service

```
# 加入
EnvironmentFile=/etc/default/docker
# 尾部加入 $DOCKER_OPTS
ExecStart=/usr/bin/dockerd -H fd:// -H unix:///var/run/docker.sock -H
tcp://0.0.0.0:2375 $DOCKER_OPTS
```

完整的例子

```
neo@ubuntu:~$ sudo vim /lib/systemd/system/docker.service

[Unit]
Description=Docker Application Container Engine
Documentation=https://docs.docker.com
After=network-online.target docker.socket firewalld.service
Wants=network-online.target
Requires=docker.socket

[Service]
Type=notify
# the default is not to use systemd for cgroups because the delegate
issues still
# exists and systemd currently does not support the cgroup feature set
required
EnvironmentFile=/etc/default/docker
# for containers run by docker
ExecStart=/usr/bin/dockerd -H fd:// -H unix:///var/run/docker.sock -H
tcp://0.0.0.0:2375 $DOCKER_OPTS
ExecReload=/bin/kill -s HUP $MAINPID
LimitNOFILE=1048576
# Having non-zero Limit*s causes performance problems due to accounting
overhead
# in the kernel. We recommend using cgroups to do container-local
accounting.
LimitNPROC=infinity
LimitCORE=infinity
# Uncomment TasksMax if your systemd version supports it.
# Only systemd 226 and above support this version.
```

```
TasksMax=infinity
TimeoutStartSec=0
# set delegate yes so that systemd does not reset the cgroups of docker
containers
Delegate=yes
# kill only the docker process, not all processes in the cgroup
KillMode=process
# restart the docker process if it exits prematurely
Restart=on-failure
StartLimitBurst=3
StartLimitInterval=60s

[Install]
WantedBy=multi-user.target
```

## 重启 Docker

```
neo@ubuntu:~$ sudo systemctl daemon-reload
neo@ubuntu:~$ sudo systemctl restart docker

neo@ubuntu:~$ ps ax | grep docker
19548 ? Ssl 0:00 /usr/bin/dockerd -H fd:// -H
unix:///var/run/docker.sock -H tcp://0.0.0.0:2375 --insecure-registry
0.0.0.0:5000
```

## 验证 5000 端口可以访问

```
neo@ubuntu:~$ curl -XGET http://localhost:5000/v2/_catalog
{"repositories":[]}
```

## 推送镜像到私有仓库

### 本地镜像推送到远程私有仓库

```
docker pull busybox
docker tag busybox docker.netkiller.cn:5000/busybox
```

```
docker push docker.netkiller.cn:5000/busybox
```

## 操作演示

```
[root@localhost ~]# docker pull busybox
Using default tag: latest
latest: Pulling from library/busybox
697743189b6d: Pull complete
Digest:
sha256:061ca9704a714ee3e8b80523ec720c64f6209ad3f97c0ff7cb9ec7d19f15149f
Status: Downloaded newer image for busybox:latest

[root@localhost ~]# docker tag busybox docker.netkiller.cn:5000/busybox

[root@localhost ~]# docker push docker.netkiller.cn:5000/busybox
The push refers to repository [docker.netkiller.cn:5000/busybox]
adab5d09ba79: Pushed
latest: digest:
sha256:4415a904b1aca178c2450fd54928ab362825e863c0ad5452fd020e92f7a6a47e
size: 527
```

## 查看远程私有仓库

```
[root@localhost ~]# curl -XGET
http://docker.netkiller.cn:5000/v2/_catalog
{"repositories":["busybox"]}

[root@localhost ~]# curl -XGET
http://docker.netkiller.cn:5000/v2/busybox/tags/list
{"name":"busybox","tags":["latest"]}
```

## 从私有仓库拉镜像

```
docker pull docker.netkiller.cn:5000/busybox
```

## 查询镜像

[http://localhost:5000/v2/\\_catalog](http://localhost:5000/v2/_catalog)

如果我们想要查询私有仓库中的所有镜像，使用docker search命令：

```
docker search registry_ipaddr:5000/
```

如果要查询仓库中指定账户下的镜像，则使用如下命令：

```
docker search registry_ipaddr:5000/account/
```

## 操作演示

```
[root@localhost ~]# curl -XGET  
http://docker.netkiller.cn:5000/v2/_catalog  
{"repositories":["busybox"]}  
  
[root@localhost ~]# curl -XGET  
http://docker.netkiller.cn:5000/v2/busybox/tags/list  
{"name": "busybox", "tags": ["latest"]}
```

## registry 镜像高级配置

/etc/docker/registry/config.yml

```
cat config.yml  
  
version: 0.1  
log:  
  fields:  
    service: registry  
storage:
```

```
delete:
  enabled: true
cache:
  blobdescriptor: inmemory
filesystem:
  rootdirectory: /var/lib/registry
http:
  addr: :5000
  headers:
    X-Content-Type-Options: [nosniff]
health:
  storagedriver:
    enabled: true
    interval: 10s
    threshold: 3
```

私有仓库认证

创建密码文件

```
docker run --entrypoint htpasswd registry -Bbn testuser testpassword >
auth/htpasswd
```

启动 docker

```
docker run -d -p 5000:5000 --restart=always --name docker-hub \
-v /opt/registry:/var/lib/registry \
-v /opt/auth:/auth \
-e "REGISTRY_AUTH=htpasswd" \
-e "REGISTRY_AUTH_HTPASSWD_REALM=Registry Realm" \
-e REGISTRY_AUTH_HTPASSWD_PATH=/auth/htpasswd \
registry
```

登录

```
docker login -u testuser -p testpassword docker.netkiller.cn:5000
```

退出

```
docker logout docker.netkiller.cn:5000
```

## registry 接口

查看仓库 [http://registry:5000/v2/\\_catalog](http://registry:5000/v2/_catalog)

```
curl -XGET http://registry:5000/v2/_catalog
```

查看镜像

```
curl -XGET http://registry:5000/v2/image_name/tags/list
```

删除镜像

```
DELETE /v2/<name>/manifests/<reference>
```

name: 镜像名称

reference: 镜像对应sha256值

处理器测试

```
curl -I -X DELETE  
http://registry:5000/v2/netkiller/manifests/sha256:6a67ba482a8dd4f8143ac  
96b1dcffa5e45af95b8d3e37aeba72401a5afd7ab8e
```

### **11.3. Harbor**

Harbor 是 Vmware 公司开源的 企业级的 Docker Registry 管理项目，它提供 Docker Registry 管理 WebUI，可基于角色访问控制, AD/LDAP 集成，日志审核等功能，完全的支持中文。

开源项目地址 <https://github.com/vmware/harbor>

## 12. Swarms

Swarm 是一组运行着Docker的机器。经过这些配置后，将节点加入到一个集群中，你仍然像之前那样运行Docker命令一样管理集群上的容器。这些命令由swarm manager在集群上执行。这些机器可以是真实的机器，也可以是虚拟机。机器加入到一个swarm后，可以称这些机器为节点(node)。

### 12.1. 管理 Swarms

帮助命令

```
neo@MacBook-Pro ~ % docker-machine
Usage: docker-machine [OPTIONS] COMMAND [arg...]

Create and manage machines running Docker.

Version: 0.16.1, build cce350d7

Author:
  Docker Machine Contributors - <https://github.com/docker/machine>

Options:
  --debug, -D                                Enable debug mode
  --storage-path, -s "/Users/neo/.docker/machine"    Configures storage path
  [$MACHINE_STORAGE_PATH]
  --tls-ca-cert                                CA to verify remotes
against [$MACHINE_TLS_CA_CERT]
  --tls-ca-key                                 Private key to generate
certificates [$MACHINE_TLS_CA_KEY]
  --tls-client-cert                           Client cert to use for
TLS [$MACHINE_TLS_CLIENT_CERT]
  --tls-client-key                            Private key used in
client TLS auth [$MACHINE_TLS_CLIENT_KEY]
  --github-api-token                         Token to use for requests
to the Github API [$MACHINE_GITHUB_API_TOKEN]
  --native-ssh                                Use the native (Go-based)
SSH implementation. [$MACHINE_NATIVE_SSH]
  --bugsnag-api-token                        BugSnag API token for
crash reporting [$MACHINE_BUGSNAG_API_TOKEN]
  --help, -h                                  show help
  --version, -v                               print the version

Commands:
  active          Print which machine is active
  config          Print the connection config for machine
  create          Create a machine
  env             Display the commands to set up the environment for the
Docker client
  inspect         Inspect information about a machine
  ip              Get the IP address of a machine
  kill            Kill a machine
```

```
ls                      List machines
provision               Re-provision existing machines
regenerate-certs        Regenerate TLS Certificates for a machine
restart                 Restart a machine
rm                      Remove a machine
ssh                     Log into or run a command on a machine with SSH.
scp                     Copy files between machines
mount                  Mount or unmount a directory from a machine with SSHFS.
start                  Start a machine
status                 Get the status of a machine
stop                   Stop a machine
upgrade                Upgrade a machine to the latest version of Docker
url                    Get the URL of a machine
version                Show the Docker Machine version or a machine docker
version
help                   Shows a list of commands or help for one command

Run 'docker-machine COMMAND --help' for more information on a command.
```

## 查看 Swarms 版本

```
neo@MacBook-Pro ~ % docker-machine version
docker-machine version 0.16.1, build cce350d7
```

## 初始化 Swarms

```
neo@MacBook-Pro ~/workspace/docker/docker-compose % docker swarm init
Swarm initialized: current node (t8gqr7wfyeis9n8wuegy4j6gn) is now a manager.

To add a worker to this swarm, run the following command:

    docker swarm join --token SWMTKN-1-
5w5joob510ug74m9vfn2j1a41nox3ddh6eiyrgonm38zaoj5c-bo2q6tdem9ihd68gryuelb42x
192.168.65.3:2377

To add a manager to this swarm, run 'docker swarm join-token manager' and follow
the instructions.
```

## 显示 join-token

```
neo@MacBook-Pro ~ % docker swarm join-token manager
To add a manager to this swarm, run the following command:
```

```
docker swarm join --token SWMTKN-1-  
200v95u6lkow6wyxne11144rhhwy1zfvawnrqo39i44sqay8vp-1vltdz94y79mgech56wtnj9n  
192.168.65.3:2377
```

## 创建虚拟机

使用VirtualBox驱动， 创建虚拟机：

```
neo@MacBook-Pro ~ % docker-machine create --driver virtualbox vm1  
neo@MacBook-Pro ~ % docker-machine create --driver virtualbox vm2
```

## 显示虚拟机列表

```
$ docker-machine ls
```

## 设置管理节点

配置虚拟机作为manager节点，用以执行管理命令并准许其他worker加入到swarm中。

```
$ docker-machine ssh vm1 "docker swarm init --advertise-addr <ip_address>"
```

## 加入到管理节点

```
$ docker-machine ssh vm2 "docker swarm join \  
--token <token> \  
<ip>:2377"
```

## 查看节点列表

```
$ docker-machine ssh vm1 "docker node ls"
```

## 环境变量

```
$ docker-machine env vm1
```

现在运行docker-machine ls来验证vm1就是当前的活跃机器，会有星号标识：

```
$ docker-machine ls
```

## 切换节点

```
eval $(docker-machine env vm1)
```

重置 shell 环境

```
neo@MacBook-Pro ~ % docker-machine env -u
unset DOCKER_TLS_VERIFY
unset DOCKER_HOST
unset DOCKER_CERT_PATH
unset DOCKER_MACHINE_NAME
# Run this command to configure your shell:
# eval $(docker-machine env -u)
```

```
eval $(docker-machine env -u)
```

## 启动/停止节点

```
$ docker-machine start vm1
```

```
$ docker-machine stop vm1
```

离线

```
docker swarm leave --force
```

## 12.2. Stack

stack 是一组相互关联的services，这些services之间相互依赖，并能够一起进行编排和scale。单个stack就能够定义和协调整个应用程序的功能.

Stack 使用 docker-compose.yml 部署，Stack 与 docker-compose 的区别是，Stack 无法 build 镜像，不支持 v2会v1 版本的 docker-compose.yml

创建 docker-compose.yml

```
version: "3"
services:
  web:
    # replace username/repo:tag with your name and image details
    image: nginx
    deploy:
      replicas: 5
      restart_policy:
        condition: on-failure
      resources:
        limits:
          cpus: "0.1"
          memory: 50M
    ports:
      - "80:80"
    networks:
      - webnet
  visualizer:
    image: dockersamples/visualizer:stable
    ports:
      - "8080:8080"
    volumes:
      - "/var/run/docker.sock:/var/run/docker.sock"
    deploy:
      placement:
```

```
constraints: [node.role == manager]
networks:
- webnet
networks:
webnet:
```

### 部署 docker-compose.yml

```
neo@MacBook-Pro ~ % docker stack deploy -c docker-compose.yml visualizer
Creating service visualizer_web
Creating service visualizer_visualizer
```

### 查看部署

```
neo@MacBook-Pro ~ % docker stack ls
NAME          SERVICES          ORCHESTRATOR
visualizer    2                Swarm
```

```
neo@MacBook-Pro ~ % docker stack services visualizer
ID          NAME          MODE          REPLICAS
IMAGE          PORTS
h6vpdk8wqr8w  visualizer_visualizer  replicated  1/1
dockersamples/visualizer:stable  *:8080->8080/tcp
tm5rre8d4kni  visualizer_web      replicated  5/5
nginx:latest           *:80->80/tcp
```

```
neo@MacBook-Pro ~ % docker stack ps visualizer
ID          NAME          IMAGE
NODE          DESIRED STATE   CURRENT STATE   ERROR
PORTS
rnkgapj5oozr  visualizer_visualizer.1  dockersamples/visualizer:stable
linuxkit-025000000001  Running        Running 24 minutes ago
msstpz0uavxp  \_ visualizer_visualizer.1  dockersamples/visualizer:stable
linuxkit-025000000001  Shutdown       Rejected 31 minutes ago  "No such
image: dockersamples/..."
1jmhrzmlsy0j    \_ visualizer_visualizer.1  dockersamples/visualizer:stable
linuxkit-025000000001  Shutdown       Rejected 31 minutes ago  "No such
image: dockersamples/..."
p7iyq0147oh0    \_ visualizer_visualizer.1  dockersamples/visualizer:stable
linuxkit-025000000001  Shutdown       Rejected 31 minutes ago  "No such
```

```
image: dockersamples/...
jdc7cx00a994      \_ visualizer_visualizer.1    dockersamples/visualizer:stable
linuxkit-025000000001  Shutdown          Rejected 32 minutes ago  "No such
image: dockersamples/...
pttqpa4z21id      visualizer_web.1           nginx:latest
linuxkit-025000000001  Running           Running 30 minutes ago
rappf97c8dtb       visualizer_web.2           nginx:latest
linuxkit-025000000001  Running           Running 30 minutes ago
t3dcjqf0fsly      visualizer_web.3           nginx:latest
linuxkit-025000000001  Running           Running 30 minutes ago
jtztvsqccb5d      visualizer_web.4           nginx:latest
linuxkit-025000000001  Running           Running 30 minutes ago
ldb92uky85oc      visualizer_web.5           nginx:latest
linuxkit-025000000001  Running           Running 30 minutes ago
```

```
neo@MacBook-Pro ~ % docker node ls
ID                      HOSTNAME        STATUS
AVAILABILITY   MANAGER STATUS      ENGINE VERSION
t8gqr7wfyieis9n8wuegy4j6gn *  linuxkit-025000000001  Ready          Active
Leader          18.09.2
```

```
neo@MacBook-Pro ~ % docker service ls
ID                      NAME            MODE        REPLICAS
IMAGE                  PORTS
h6vpdk8wqr8w      visualizer_visualizer  replicated  1/1
dockersamples/visualizer:stable  *:8080->8080/tcp
tm5rre8d4kni      visualizer_web       replicated  5/5
nginx:latest          *:80->80/tcp
```

```
neo@MacBook-Pro ~ % docker stack rm visualizer
Removing service visualizer_visualizer
Removing service visualizer_web
Removing network visualizer_webnet
```

## 12.3. 服务

```
neo@MacBook-Pro ~ % docker service
Usage:  docker service COMMAND
```

```
Manage services

Commands:
  create      Create a new service
  inspect     Display detailed information on one or more services
  logs        Fetch the logs of a service or task
  ls          List services
  ps          List the tasks of one or more services
  rm          Remove one or more services
  rollback   Revert changes to a service's configuration
  scale       Scale one or multiple replicated services
  update     Update a service

Run 'docker service COMMAND --help' for more information on a command.
```

## 创建 Service

```
$ docker service create \
--replicas 10 \
--name ping_service \
alpine ping www.netkiller.cn
```

```
$ docker service create --replicas 1 --name my-prometheus \
  --mount
type=bind,source=/tmp/prometheus.yml,destination=/etc/prometheus/prometheus.yml \
  --publish published=9090,target=9090,protocol=tcp \
  prom/prometheus
```

```
iMac:redis neo$ docker stack deploy -c redis.yml redis
Creating service redis_redis
```

## 提示

--mount 不允许使用相对路径，小技巧 `pwd`/prometheus.yml

```
docker service create --replicas 1 --name my-prometheus \
  --mount
type=bind,source=`pwd`/prometheus.yml,destination=/etc/prometheus/prometheus.yml \
  --publish published=9090,target=9090,protocol=tcp \
```

```
prom/prometheus
```

## 删除 Service

```
iMac:docker neo$ docker service rm prometheus  
prometheus
```

如果是 stack 部署的也可以这样删除

```
iMac:redis neo$ docker stack rm redis  
Removing service redis_redis
```

## inspect

```
iMac:redis neo$ docker service inspect redis_redis  
[  
  {  
    "ID": "kpqopqq10a2yi1rdecuf1246q",  
    "Version": {  
      "Index": 10148  
    },  
    "CreatedAt": "2020-09-26T14:19:53.920458941Z",  
    "UpdatedAt": "2020-09-26T14:19:53.922204086Z",  
    "Spec": {  
      "Name": "redis_redis",  
      "Labels": {  
        "com.docker.stack.image": "redis:latest",  
        "com.docker.stack.namespace": "redis"  
      },  
      "TaskTemplate": {  
        "ContainerSpec": {  
          "Image":  
            "redis:latest@sha256:1cfb205a988a9dae5f025c57b92e9643ec0e7ccff6e66bc639d8a5f95bba928c",  
          "Labels": {  
            "com.docker.stack.namespace": "redis",  
            "desktop.docker.io-mounts/0/Source":  
              "/Users/neo/workspace/docker/docker-compose/redis/redis.conf",  
            "desktop.docker.io-mounts/0/SourceKind": "hostFile",  
            "desktop.docker.io-mounts/0/Target":  
              "/etc/redis/redis.conf"  
          },  
        }  
      }  
    }  
  }  
]
```

```
        "Args": [
            "entrypoint.sh",
            "/etc/redis/redis.conf"
        ],
        "Hostname": "redis",
        "Env": [
            "TZ=Asia/Shanghai"
        ],
        "Privileges": {
            "CredentialSpec": null,
            "SELinuxContext": null
        },
        "Mounts": [
            {
                "Type": "bind",
                "Source": "/host_mnt/Users/neo/workspace/docker/docker-compose/redis/redis.conf",
                "Target": "/etc/redis/redis.conf"
            },
            {
                "Type": "bind",
                "Source": "/var/lib/redis",
                "Target": "/var/lib/redis"
            },
            {
                "Type": "bind",
                "Source": "/var/log/redis",
                "Target": "/var/log/redis"
            }
        ],
        "StopGracePeriod": 10000000000,
        "DNSConfig": {},
        "Isolation": "default"
    },
    "Resources": {
        "Limits": {
            "NanoCPUs": 1000000000,
            "MemoryBytes": 536870912
        }
    },
    "RestartPolicy": {
        "Condition": "any",
        "Delay": 5000000000,
        "MaxAttempts": 0
    },
    "Placement": {
        "Platforms": [
            {
                "Architecture": "amd64",
                "OS": "linux"
            },
            {
                "OS": "linux"
            },
            {
                "OS": "linux"
            },
            {
                "OS": "linux"
            }
        ]
    }
}
```

```
{
    "Architecture": "arm64",
    "OS": "linux"
},
{
    "Architecture": "386",
    "OS": "linux"
},
{
    "Architecture": "mips64le",
    "OS": "linux"
},
{
    "Architecture": "ppc64le",
    "OS": "linux"
},
{
    "Architecture": "s390x",
    "OS": "linux"
}
]
},
"Networks": [
{
    "Target": "gvcz5y66ovrlqfaxb02zx026t",
    "Aliases": [
        "redis"
    ]
}
],
"ForceUpdate": 0,
"Runtime": "container"
},
"Mode": {
    "Replicated": {
        "Replicas": 1
    }
},
"UpdateConfig": {
    "Parallelism": 1,
    "Delay": 5000000000,
    "FailureAction": "pause",
    "Monitor": 10000000000,
    "MaxFailureRatio": 0.1,
    "Order": "start-first"
},
"RollbackConfig": {
    "Parallelism": 1,
    "FailureAction": "pause",
    "Monitor": 5000000000,
    "MaxFailureRatio": 0,
    "Order": "stop-first"
},
"EndpointSpec": {
    "Mode": "vip",
    "Ports": [
        {
            "ContainerPort": 8080,
            "HostPort": 8080
        }
    ],
    "TLS": {
        "Mode": "none"
    }
}
}
```

```
        "Protocol": "tcp",
        "TargetPort": 6379,
        "PublishedPort": 6379,
        "PublishMode": "ingress"
    }
]
}
},
"Endpoint": {
    "Spec": {
        "Mode": "vip",
        "Ports": [
            {
                "Protocol": "tcp",
                "TargetPort": 6379,
                "PublishedPort": 6379,
                "PublishMode": "ingress"
            }
        ]
    },
    "Ports": [
        {
            "Protocol": "tcp",
            "TargetPort": 6379,
            "PublishedPort": 6379,
            "PublishMode": "ingress"
        }
    ],
    "VirtualIPs": [
        {
            "NetworkID": "7r7k9robn0uuojuxl1es2wdds",
            "Addr": "10.0.0.42/24"
        },
        {
            "NetworkID": "gvcz5y66ovrlqfaxb02zx026t",
            "Addr": "172.12.0.2/16"
        }
    ]
}
}
]
```

## 12.4. swarm 卷管理

swarm 不能使用 -v /mysite:/usr/share/nginx/html 挂载卷，系统会提示

```
unknown shorthand flag: 'v' in -v
See 'docker service create --help'.
```

## Host Volumes

```
$ docker service create --name nginx \
--mount type=bind,source=`pwd`/static-site,target=/usr/share/nginx/html \
-p 80:80 nginx
```

## Named Volumes

```
$ docker service create --name nginx \
--mount type=volume,source=web,target=/usr/share/nginx/html \
-p 80:80 nginx
```

## 共享卷

### 创建 NFS 数据共享卷

```
docker volume create --driver local \
--opt type=nfs4 \
--opt o=addr=< NFS-Server >,rw \
--opt device=:< Shared-Path > \
share
```

### 创建服务副本

```
docker service create \
--mount type=volume,source=<Volume-Name>,destination=<Container-Path> \
--replicas 2 \
<Image>
```

## 13. docker-compose.yml 容器编排

本章节介绍如何定义 docker-compose.yml 文件

首先创建项目目录

```
mkdir docker  
cd docker  
vim      docker-compose.yml
```

### 13.1. 版本号

```
version: '3.8'
```

### 13.2. 镜像

image: mysql:5.7 表示使用 mysql:5.7 镜像, image: mysql:latest 表示 mysql 最新版

```
services:  
  db:  
    image: mysql:5.7  
    volumes:  
      - db_data:/var/lib/mysql  
    restart: always  
    environment:  
      MYSQL_ROOT_PASSWORD: somewordpress  
      MYSQL_DATABASE: wordpress  
      MYSQL_USER: wordpress  
      MYSQL_PASSWORD: wordpress
```

### 13.3. 容器名称

```
prometheus:
  image: prom/prometheus
  container_name: prometheus
```

## 13.4. 启动策略

```
restart: unless-stopped
```

## 13.5. 容器用户

```
# Define in docker-compose:

services:
  prometheus:
    image: prom/prometheus
    user: "1000:1000"

services:
  prometheus:
    image: prom/prometheus
    user: root

# Dockerfile

USER 1000:1000
```

## 13.6. 挂在卷

```
volumes:
  - db_data:/var/lib/mysql
```

## 13.7. 映射端口的标签

将容器中的端口暴漏给宿主主机。

```
ports:
- "3000"
- "80:80"
- "22:22"
- "127.0.0.1:8000:8000"
```

默认 "端口:端口" 将监听 127.0.0.1 主机。如果需要将端口暴漏出去，格式是"IP:PORT:PORT"，IP地址是宿主主机的网络适配器IP地址。

## 13.8. 添加 hosts 文件

往/etc/hosts文件中添加主机名，与Docker client的--add-host类似：

```
extra_hosts:
- "orderer.example.com:10.130.116.8"
- "peer0.org1.example.com:10.130.116.9"
- "peer1.org1.example.com:10.130.116.10"
- "peer0.org2.example.com:10.130.116.25"
- "peer1.org2.example.com:10.130.116.27"
```

## 13.9. 网络配置

### 自定义 IPv4 子网地址

```
version: '3.9'
networks:
 default:
   driver: bridge
   ipam:
     driver: default
     config:
       - subnet: 172.88.10.0/24
         gateway: 172.88.10.1
```

## **external 外部网络**

创建固定网段的网络bridge2。

```
docker network create --subnet=10.16.1.0/16 --gateway=10.16.1.1 --opt  
"com.docker.network.bridge.name"="bridge2" bridge2
```

把bridge2网络配置导docker-compose里面。

```
networks:  
  default:  
    driver: bridge  
  persist:  
    external:  
      name: bridge2
```

## **配置 IPv6**

```
networks:  
  frontend:  
    # use the bridge driver, but enable IPv6  
    driver: bridge  
    driver_opts:  
      com.docker.network.enable_ipv6: "true"  
  ipam:  
    driver: default  
    config:  
      - subnet: 172.16.238.0/24  
        gateway: 172.16.238.1  
      - subnet: "2001:3984:3989::/64"  
        gateway: "2001:3984:3989::1"
```

## **13.10. links 主机别名**

links的作用是在当前服务里面创建一个链接外部服务的别名。

## docker-compose.yml

```
services:  
  tomcat:  
    image: netkiller:latest  
    links:  
      - mysql:db.netkiller.cn
```

这时配置文件 application.properties 就可以这样些

```
sql.mysql.jdbc-url=jdbc:mysql://db.netkiller.cn:3306/test?  
characterEncoding=utf8&serverTimezone=UTC&autoReconnect=true&useSSL=false  
sql.mysql.username=root  
sql.mysql.password=abcdef  
sql.mysql.driverClassName=com.mysql.jdbc.Driver
```

## 13.11. 链接外部容器

创建 development 网络

```
docker network create development --driver bridge  
docker run --name redis-external --net development -d redis
```

```
version: "3.9"  
networks:  
  default:  
  external:  
    name: development  
services:  
  demo-external:  
    image: demo:1.0  
    container_name: demo-external  
    restart: always
```

```
environment:  
  REDIS_HOST: redis-external  
ports:  
  - 80:80  
external_links:  
  - redis-external
```

测试方法，进入 demo-external 容器，然后 ping redis-external 容器

```
docker exec -it demo-external ping redis-external
```

```
[root@netkiller docker]# docker exec -it demo-external ping redis-  
external  
PING redis-external (172.18.0.3) 56(84) bytes of data.  
64 bytes from redis-external.development (172.18.0.3): icmp_seq=1 ttl=64  
time=0.091 ms  
64 bytes from redis-external.development (172.18.0.3): icmp_seq=2 ttl=64  
time=0.122 ms  
64 bytes from redis-external.development (172.18.0.3): icmp_seq=3 ttl=64  
time=0.185 ms
```

## 13.12. 服务依赖

通过depends\_on告诉docker-compose当前服务启动之前先要把depends\_on指定的服务启动起来才行。

```
services:  
  kafka:  
    image: tflinux_kafka  
    depends_on:  
      - zookeeper  
  spring:  
    image: springboot  
    depends_on:  
      - redis  
      - mysql
```

### 13.13. working\_dir

```
working_dir
```

### 13.14. 设置环境变量

environment 实现容器中环境变量的定义

```
version: '3'

networks:
  basic:

services:
  tools:
    container_name: tools
    image: hyperledger/fabric-tools
    tty: true
    environment:
      - GOPATH=/opt/gopath
      - CORE_VM_ENDPOINT=unix:///host/var/run/docker.sock
      - CORE_LOGGING_LEVEL=DEBUG
      - CORE_PEER_ID=cli
      - CORE_PEER_ADDRESS=peer0.org1.example.com:7051
      - CORE_PEER_LOCALMSPID=Org1MSP
      -
      CORE_PEER_MSPCONFIGPATH=/opt/gopath/src/github.com/hyperledger/fabric/peer/crypto/peerOrganizations/org1.example.com/users/Admin@org1.example.com/msp
        - CORE_CHAINCODE_KEEPALIVE=10
    # working_dir: /opt/gopath/src/github.com/hyperledger/fabric/peer
    working_dir: /root/netkiller
    command: /bin/bash
    volumes:
      - /var/run/:/host/var/run/
      - ~/netkiller:/root/netkiller
      - ./chaincode/:/opt/gopath/src/github.com/
      -
    ./crypto:/opt/gopath/src/github.com/hyperledger/fabric/peer/crypto/
  networks:
```

```
- basic
```

## 13.15. 临时文件系统

挂载临时目录到容器：

```
tmpfs: /run  
tmpfs:  
- /run  
- /tmp
```

## 13.16. 编译 Dockerfile

编译当前目录下的 Dockerfile 使用 build: .

```
version: '3'  
services:  
  web:  
    build: .  
    ports:  
      - "5000:5000"
```

指定镜像名称

```
version: "3.7"  
services:  
  redis-image:  
    build:  
      context: .  
      dockerfile: Dockerfile  
      args:  
        - node=master  
    image: netkiller/redis:latest  
    container_name: redis  
    restart: always  
    ports:
```

```
- "6379:6379"
networks:
  - redis
privileged: true
sysctls:
  net.core.somaxconn: '511'
ulimits:
  nproc: 65535
  nofile:
    soft: 65535
    hard: 65535
```

## docker-compose build redis-image 构建镜像

```
neo@MacBook-Pro ~/workspace/docker/docker-compose/redis/cluster %
docker-compose build redis-image
Building redis-image
Step 1/12 : FROM redis:latest
--> a55fbf438dfd
Step 2/12 : ARG node
--> Using cache
--> 4deb8fc1e1df
Step 3/12 : ENV REDIS_PORT 6379
--> Using cache
--> 5723ff2fe55c
Step 4/12 : COPY redis.conf /etc/redis/redis.conf
--> Using cache
--> daf496f8c342
Step 5/12 : COPY docker-entrypoint.sh /usr/local/bin/
--> Using cache
--> 600ae3b0c059
Step 6/12 : RUN ln -sf /usr/share/zoneinfo/Asia/Shanghai /etc/localtime
--> Using cache
--> 630e3813bc8f
Step 7/12 : RUN echo 'Asia/Shanghai' >/etc/timezone
--> Using cache
--> 7d48350d6621
Step 8/12 : RUN echo 'echo never >
/sys/kernel/mm/transparent_hugepage/enabled' > /etc/rc.local
--> Using cache
--> c096dc75da72
Step 9/12 : RUN chmod +rw /etc/redis/redis.conf
--> Using cache
--> 25d8b0ac8893
Step 10/12 : EXPOSE $REDIS_PORT
--> Using cache
--> 99f31a88d2ff
```

```
Step 11/12 : ENTRYPOINT [ "/usr/local/bin/docker-entrypoint.sh" ]
--> Using cache
--> ef98f89610ae
Step 12/12 : CMD [ "redis-server", "/etc/redis/redis.conf" ]
--> Using cache
--> 095823650068

Successfully built 095823650068
Successfully tagged netkiller/redis:latest

neo@MacBook-Pro ~/workspace/docker/docker-compose/redis/cluster % docker
images | grep netkiller/redis
netkiller/redis                               latest
095823650068      8 minutes ago      95MB
```

## 13.17. resources 硬件资源分配

```
version: "3"
services:
  node:
    build:
      context: .
      dockerfile: ./Dockerfile
    restart: always
    environment:
      - HOST=localhost
    volumes:
      - logs:/app/logs
    expose:
      - 8080
    deploy:
      resources:
        limits:
          cpus: '0.001'
          memory: 50M
        reservations:
          cpus: '0.0001'
          memory: 20M
```

### 提示

注意：启动必须加入 --compatibility 选项

```
docker-compose --compatibility up
```

## 14. Docker Example

### 14.1. registry

```
docker run -d -p 5000:5000 --name registry registry:latest
```

#### Auth + SSL

```
iMac:registry neo$ mkdir etc  
iMac:registry neo$ htpasswd -Bbn neo chen > etc/htpasswd  
  
or  
  
docker run --entrypoint htpasswd registry:2 -Bbn neo passw0rd >  
etc/htpasswd
```

```
docker run -d \  
  --restart=always \  
  --name registry \  
  -v `pwd`/etc:/usr/local/etc \  
  -e "REGISTRY_AUTH=htpasswd" \  
  -e "REGISTRY_AUTH_HTPASSWD_REALM=Registry Realm" \  
  -e REGISTRY_AUTH_HTPASSWD_PATH=/usr/local/etc/htpasswd \  
  -e REGISTRY_HTTP_ADDR=0.0.0.0:443 \  
  -e REGISTRY_HTTP_TLS_CERTIFICATE=/usr/local/etc/domain.cer \  
  -e REGISTRY_HTTP_TLS_KEY=/usr/local/etc/domain.key \  
  -p 443:443 \  
  registry:2
```

## 14.2. Example Java - Spring boot with Docker

获取 CentOS 7 镜像

docker pull centos:7

```
# docker pull centos:7
7: Pulling from library/centos
343b09361036: Pull complete
Digest:
sha256:bba1de7c9d900a898e3cadbae040dfe8a633c06bc104a0df76ae24483e03c077
Status: Downloaded newer image for centos:7
```

基于 CentOS 7 运行一个容器

docker run -it --name mycentos docker.io/centos:7 /bin/bash

```
# docker run -it --name mycentos docker.io/centos:7 /bin/bash
```

运行后直接进入了容器的shell控制台默认是bash

安装 openjdk

```
# yum install -y java-1.8.0-openjdk

# cat >> /etc/profile.d/java.sh <<'EOF'
export JAVA_HOME=/usr/java/default
export JAVA_OPTS="-server -Xms2048m -Xmx4096m -Djava.io.tmpdir=/tmp -
Djava.security.egd=file:/dev/.urandom -Dfile.encoding=UTF8 -
Duser.timezone=GMT+08"
export CLASSPATH=$JAVA_HOME/lib:$JAVA_HOME/jre/lib:.
export PATH=$PATH:$JAVA_HOME/bin:$JAVA_HOME/jre/bin:
EOF

# source /etc/profile.d/java.sh
```

## 检查Java是否安装成功

```
# whereis java  
java: /usr/bin/java /usr/lib/java /etc/java /usr/share/java  
/usr/share/man/man1/java.1.gz  
  
# java -version  
openjdk version "1.8.0_131"  
OpenJDK Runtime Environment (build 1.8.0_131-b11)  
OpenJDK 64-Bit Server VM (build 25.131-b11, mixed mode)
```

## 创建应用程序目录

```
# mkdir -p /www/netkiller.cn/www.netkiller.cn/
```

## 推出当前容器

```
# exit
```

## Spring boot 包

### 复制 jar 文件到Docker容器

```
docker cp /www/netkiller.cn/www.netkiller.cn/www.netkiller.cn-0.0.1.war  
mycentos:/usr/local/libexec
```

## 启动 Spring boot 项目

### 启动容器

```
# docker start mycentos  
mycentos
```

## 进入容器

```
# docker exec -it mycentos /bin/bash
```

如果仅仅是测试可以手动启动 Spring boot 项目

```
# cat >> /root/run.sh <<EOF
java -server -Xms2048m -Xmx8192m -jar
/usr/local/libexec/www.netkiller.cn-0.0.1.war
EOF

chmod u+x /root/run.sh
```

生产环境请使用启动脚本

```
# curl -s
https://raw.githubusercontent.com/oscml/build/master/Application/Spring/
service/springbootd -o /etc/init.d/springbootd
# chmod +x /etc/init.d/springbootd
```

编辑启动脚本 /etc/init.d/springbootd 修改下面配置项

```
#####
BASEDIR="/www/netkiller.cn/api.netkiller.cn"
JAVA_HOME=/srv/java
JAVA_OPTS="-server -Xms2048m -Xmx8192m -
Djava.security.egd=file:/dev/.urandom"
PACKAGE="api.netkiller.cn-0.0.2-release.jar"
CONFIG="--spring.config.location=$BASEDIR/application.properties -
Dspring.profiles.active=production -Dserver.port=8080 -Dlog.level=info"
USER=www
#####
```

```
NAME=springbootd
PROG="$JAVA_HOME/bin/java $JAVA_OPTS -jar $BASEDIR/$PACKAGE $CONFIG"
LOGFILE=/var/tmp/$NAME.log
PIDFILE=/var/tmp/$NAME.pid
ACCESS_LOG=/var/tmp/$NAME.access.log
#####
#####
```

你也可以使用 systemd 启动脚本，详见《Netkiller Java 手札》

## 基于 CentOS 7 制作 spring 镜像

docker commit mycentos springboot:1

```
# docker commit mycentos springboot:1
sha256:757d92d642d1b5a7b244f6ddf89f24a8d463d154438651c83ba51a644b401782
```

启动 spring boot 容器

```
# docker run -d --name springboot -p 80:8080 springboot:1 /root/run.sh
```

-d: 以守护进程方式启动  
--name: 指定容器的名称  
-p: 映射容器8080端口到宿主机的80端口  
springboot:1 : 上一步制作好的springboot镜像, 版本号为1

启动容器

```
# docker start springboot
```

停止容器

```
# docker stop springboot
```

### 14.3. Redis

<http://download.redis.io/redis-stable/redis.conf>

<http://download.redis.io/redis-stable/sentinel.conf>

#### Docker 命令

获取 Redis 镜像

docker pull redis

```
# docker pull redis
Using default tag: latest
latest: Pulling from library/redis
10a267c67f42: Pull complete
5b690bc4eaa6: Pull complete
4cdd94354d2a: Pull complete
71c1f30d820f: Pull complete
c54584150374: Pull complete
d1f9221193a6: Pull complete
d45bc46b48e4: Pull complete
Digest:
sha256:548a75066f3f280eb017a6ccda34c561ccf4f25459ef8e36d6ea582b6af1decf
Status: Downloaded newer image for redis:latest
```

启动一个 Redis 实例

```
# docker run --name my-redis -d redis
10207174e18f61290f9c869e6437fa787e459e07b076b82cedf800a8c37c515d
```

查看启动情况

```
# docker ps
CONTAINER ID        IMAGE       COMMAND
STATUS              PORTS
10207174e18f        redis      "docker-entrypoint..."   8
minutes ago         Up 8 minutes    6379/tcp           my-redis
```

### 进入 Redis

```
# docker run -it --link my-redis:redis --rm redis redis-cli -h redis -p
6379
redis:6379> set name neo
OK
redis:6379> get name
"neo"
redis:6379> exit
```

### 启动一个 Redis 实例并映射 6379 端口

```
# docker stop my-redis
my-redis

# docker rm my-redis
my-redis

# docker run --name my-redis -d -p 6379:6379 redis
10207174e18f61290f9c869e6437fa787e459e07b076b82cedf800a8c37c515d

# docker ps -a
CONTAINER ID        IMAGE       COMMAND
STATUS              PORTS
1c4540d8617f        redis      "docker-entrypoint..."   2
seconds ago         Up 1 second    0.0.0.0:6379->6379/tcp   my-redis
```

### 检查端口

```
# ss -lnt | grep 6379
LISTEN      0          128          ::::6379          ::::*
```

维护容器

使用下面命令进入容器维护 Redis

```
# docker exec -it my-redis /bin/bash
root@1c4540d8617f:/data# 

root@1c4540d8617f:/data# redis-server -v
Redis server v=3.2.9 sha=00000000:0 malloc=jemalloc-4.0.3 bits=64
build=a30533b464d1689b
```

## Docker compose

```
version: "3.7"
services:
  redis:
    image: redis:latest
    container_name: redis
    ports:
      - "6379:6379"
    volumes:
      - redis_data:/var/lib/redis
    restart: always
    networks:
      - dev

networks:
  dev:
    driver: bridge

volumes:
  redis_data:
```

```
version: '3.9'
```

```
services:
  redis:
    image: redis:alpine
    container_name: redis
    restart: always
    hostname: redis.netkiller.cn
    user: redis:redis
    privileged: true
    environment:
      - TZ=Asia/Shanghai
      - LANG=en_US.UTF-8
  ports:
    - 6379:6379
  volumes:
    - ./conf/redis.conf:/etc/redis.conf
    - redis:/var/lib/redis
    - ./logs:/var/log/redis
  entrypoint: redis-server /etc/redis.conf
  command:
    --requirepass passw0rd
volumes:
  redis:
```

## 确认配置生效

```
neo@MacBook-Pro-Neo ~ % docker exec -it redis redis-cli -a passw0rd
Warning: Using a password with '-a' or '-u' option on the command line
interface may not be safe.
127.0.0.1:6379> config get dir
1) "dir"
2) "/var/lib/redis"
127.0.0.1:6379>
```

## Docker Stack

```
version: '3.8'

services:
  redis:
    image: redis:latest
```

```
environment:
  - TZ=Asia/Shanghai
hostname: redis
ports:
  - 6379:6379
networks:
  - test
volumes:
  - data:/var/lib/redis
configs:
  - source: config
    target: /usr/local/etc/redis.conf
    mode: 0440
deploy:
  replicas: 1
  restart_policy:
    condition: on-failure
  resources:
    limits:
      cpus: "1"
      memory: 512M
  update_config:
    parallelism: 1
    delay: 5s
    monitor: 10s
    max_failure_ratio: 0.1
    order: start-first

configs:
  config:
    file: ./redis.conf

volumes:
  data:

networks:
  test:
    driver: overlay
```

下载 配置文件 <https://redis.io/topics/config>

```
iMac:redis neo$ curl -s0
https://raw.githubusercontent.com/redis/redis/6.0/redis.conf
iMac:redis neo$ egrep -v "^#|^$" redis.conf
```

## 修改配置文件

```
bind 0.0.0.0
logfile "/var/log/redis/redis.log"
dir /var/lib/redis
appendonly yes
```

## 创建 Docker 网络

```
iMac:redis neo$ docker network create \
>   --driver=overlay \
>   --subnet=172.12.0.0/16 \
>   --ip-range=172.12.0.0/16 \
>   --gateway=172.12.0.1 \
>   --attachable \
>   test
gvcz5y66ovrlqfaxb02zx026t

iMac:redis neo$ docker network ls
NETWORK ID      NAME      DRIVER      SCOPE
786efe30f42d    bridge    bridge      local
51e2b21d7daa    docker_gwbridge    bridge      local
96ba0de26cd2    host      host      local
7r7k9robn0uu    ingress    overlay      swarm
cbf078a5f121    none      null      local
d851mrlkludv    redis_default    overlay      swarm
q0h9awx86ef4    registry_default    overlay      swarm
cf585ea9ceb4    registry_default    bridge      local
gvcz5y66ovrl    test      overlay      swarm

iMac:redis neo$ docker stack deploy -c redis.yml redis
Creating network redis_default
Creating service redis_redis
```

## 查看服务

```
iMac:redis neo$ docker service ls
ID          NAME      MODE      REPLICAS
IMAGE
1ti2ndlphm8  redis_redis  replicated  0/1
```

```
redis:latest      *:6379->6379/tcp
lw6xjrl0sn88    registry_registry  replicated          1/1
registry:latest   *:5000->5000/tcp
```

## 查看容器运行状态

```
iMac:redis neo$ docker container ls
CONTAINER ID        IMAGE               COMMAND             CREATED            STATUS              PORTS
8407fd8fe66b       redis:latest        "docker-entrypoint.s..."   29 seconds ago   Up 29 seconds     6379/tcp
redis_redis.1.6fpqt3pdti03j9swn3x04ob9n
```

## somaxconn/overcommit\_memory

### redis 日志

```
1:C 09 Aug 2021 15:13:20.270 # o000o000o000o Redis is starting
o000o000o000o
1:C 09 Aug 2021 15:13:20.270 # Redis version=6.2.5, bits=64,
commit=00000000, modified=0, pid=1, just started
1:C 09 Aug 2021 15:13:20.270 # Configuration loaded
1:M 09 Aug 2021 15:13:20.270 * monotonic clock: POSIX clock_gettime
1:M 09 Aug 2021 15:13:20.270 * Running mode=standalone, port=6379.
1:M 09 Aug 2021 15:13:20.270 # WARNING: The TCP backlog setting of 511
cannot be enforced because /proc/sys/net/core/somaxconn is set to the
lower value of 128.
1:M 09 Aug 2021 15:13:20.270 # Server initialized
1:M 09 Aug 2021 15:13:20.270 # WARNING overcommit_memory is set to 0!
Background save may fail under low memory condition. To fix this issue
add 'vm.overcommit_memory = 1' to /etc/sysctl.conf and then reboot or
run the command 'sysctl vm.overcommit_memory=1' for this to take effect.
1:M 09 Aug 2021 15:13:20.271 * Ready to accept connections
```

## 宿主机上配置如下

```
[root@localhost ~]# cat >> /etc/sysctl.conf <<EOF
```

```
# Redis
net.core.somaxconn = 1024
vm.overcommit_memory=1
EOF
```

docker-compose.yml 中设置 net.core.somaxconn

```
[root@localhost redis]# cat docker-compose.yml
version: '3.9'

services:
  redis:
    image: redis:alpine
    container_name: redis
    restart: always
    hostname: redis.netkiller.cn
    user: redis:redis
    environment:
      - TZ=Asia/Shanghai
      - LANG=en_US.UTF-8
    ports:
      - 6379:6379
    volumes:
      - redis:/data
    sysctls:
      - net.core.somaxconn=511
    command:
      --logfile /data/redis.log
      --requirepass passw0rd
      --appendonly yes
volumes:
  redis:
```

## 14.4. Nginx

本例子使用 alpine 版本

**nginx:latest**

过程 1.1.

1.

```
[root@izj6ciilv2rcpgauqg2uuwZ]~# docker pull nginx
Using default tag: latest
latest: Pulling from library/nginx
Digest:
sha256:41ad9967ea448d7c2b203c699b429abe1ed5af331cd92533900c6d77490e0
268
Status: Image is up to date for nginx:latest
```

2. 启动容器

```
docker run --name my-nginx-container -p 80:80 -d nginx
```

上面不能满足生产环境的需求，通常不会将数据放在容器中，我的做法如下。

```
docker rm my-nginx-container -f
docker run --name my-nginx-container \
-v /srv/nginx/nginx.conf:/etc/nginx/nginx.conf:ro \
-v /srv/nginx/conf.d:/etc/nginx/conf.d:ro \
-v /var/log/nginx:/var/log/nginx:rw \
-v /www:/www:ro \
-p 80:80 -d nginx
docker ps
```

## 安装 Docker Nginx alpine

### 过程 1.2. Docker nginx

1. 获取镜像

```
# docker pull nginx:alpine
```

## 2. 运行容器

```
docker run --name my-nginx-container -v /srv/nginx:/etc/nginx:ro -v /www:/www:ro -p 80:80 -d nginx:alpine
```

## 3.

```
docker exec -it my-nginx-container /bin/bash
```

## 安装依赖工具

```
apt update -y && apt install -y procps iproute2
```

## 容器内优雅重启

首先观察一个现象，打开 linux 终端窗口，查看 nginx 进程。

```
[root@localhost ~]# ps ax | grep nginx
 6670 ?        Ss      0:00 nginx: master process /usr/sbin/nginx
 6671 ?        S      0:00 nginx: worker process
 6672 ?        S      0:00 nginx: worker process
 6673 ?        S      0:00 nginx: worker process
 6674 ?        S      0:00 nginx: worker process
 9396 pts/0    S+     0:00 grep --color=auto nginx
```

6670 ~ 6674 都是 nginx 的进程，其中 6670 nginx: master process /usr/sbin/nginx 是父进程，用于监听 80/443 端口。6671 ~ 6674 nginx: worker process 是子进程，每个进程中又产生多线程，每个线程对应一次用户TCP请求。

6671 ~ 6674 子进程的进程ID会变化，而 6670 是不变的。6670 父进程可以接收操作系统传递过来的信号（不懂信号的同学请恶补，信号，共享内存，管

道，Socket 可以实现进程间通信），也就是我们可以告诉正在运行的进程，现在要干什么。

给 6670 进程发送 HUP 信号，nginx 就会重新读取配置文件，刷新缓存，此时 6671 ~ 6674 不受影响，会继续为用户体统 TCP 链接服务，直到都安全 Close 为止。此时 6670 父进程已经完成配置的更新，6671 ~ 6674 也完成了它的使命，下一次新用户过来 nginx 就会创建新的进程，这个过程是无缝的，用户感知不到，80/443 端口始终提供服务，不会有任何用户出现中断链接的情况。

现在来演示一下，执行 reload 就会刷新配置文件，清空缓存，同时会将闲置的 nginx: worker process 关闭，并开启新的子进程。

```
[root@localhost ~]# systemctl reload nginx
[root@localhost ~]# ps ax | grep nginx
 6670 ?      Ss      0:00 nginx: master process /usr/sbin/nginx
 6671 ?      S      0:01 nginx: worker process is shutting down
 9403 ?      S      0:00 nginx: worker process
 9404 ?      S      0:00 nginx: worker process
 9405 ?      S      0:00 nginx: worker process
 9406 ?      S      0:00 nginx: worker process
 9408 pts/0    S+      0:00 grep --color=auto nginx
```

现在我们可以看到子进程ID的变化，9403 ~ 9406。父进程 nginx: master process /usr/sbin/nginx 的ID仍然是 6670

现在是容器中实现上面的 reload 操作。

```
[root@localhost ~]# cat docker-compose.yml
version: '3.9'
services:
  nginx:
    container_name: nginx
    restart: always
    image: nginx:latest
    ports:
      - 192.168.30.11:80:80
      - 192.168.30.11:443:443
```

```
[root@localhost ~]# docker-compose up
Starting nginx ... done
Attaching to nginx
nginx    | /docker-entrypoint.sh: /docker-entrypoint.d/ is not empty,
will attempt to perform configuration
nginx    | /docker-entrypoint.sh: Looking for shell scripts in /docker-
entrypoint.d/
nginx    | /docker-entrypoint.sh: Launching /docker-entrypoint.d/10-
listen-on-ipv6-by-default.sh
nginx    | 10-listen-on-ipv6-by-default.sh: info: IPv6 listen already
enabled
nginx    | /docker-entrypoint.sh: Launching /docker-entrypoint.d/20-
envsubst-on-templates.sh
nginx    | /docker-entrypoint.sh: Launching /docker-entrypoint.d/30-
tune-worker-processes.sh
nginx    | /docker-entrypoint.sh: Configuration complete; ready for
start up
nginx    | 2021/07/12 20:55:41 [notice] 1#1: using the "epoll" event
method
nginx    | 2021/07/12 20:55:41 [notice] 1#1: nginx/1.21.1
nginx    | 2021/07/12 20:55:41 [notice] 1#1: built by gcc 8.3.0 (Debian
8.3.0-6)
nginx    | 2021/07/12 20:55:41 [notice] 1#1: OS: Linux 4.18.0-
315.el8.x86_64
nginx    | 2021/07/12 20:55:41 [notice] 1#1: getrlimit(RLIMIT_NOFILE):
1048576:1048576
nginx    | 2021/07/12 20:55:41 [notice] 1#1: start worker processes
nginx    | 2021/07/12 20:55:41 [notice] 1#1: start worker process 24
nginx    | 2021/07/12 20:55:41 [notice] 1#1: start worker process 25
nginx    | 2021/07/12 20:55:41 [notice] 1#1: start worker process 26
nginx    | 2021/07/12 20:55:41 [notice] 1#1: start worker process 27
```

```
[root@localhost ~]# docker exec -it nginx bash
root@2d2637a6ac4d:/# ps ax
  PID TTY      STAT   TIME COMMAND
    1 ?        Ss      0:00 nginx: master process nginx -g daemon off;
   24 ?        S      0:00 nginx: worker process
   25 ?        S      0:00 nginx: worker process
   26 ?        S      0:00 nginx: worker process
   27 ?        S      0:00 nginx: worker process
  623 pts/0    Ss      0:00 bash
  629 pts/0    R+      0:00 ps ax
root@2d2637a6ac4d:/#
```

reload nginx

```
[root@localhost ~]# docker ps
CONTAINER ID        IMAGE               COMMAND                  CREATED
STATUS              PORTS
NAMES
2d2637a6ac4d      nginx:latest        "/docker-entrypoint..."   25 minutes ago
Up 5 minutes        192.168.30.11:80->80/tcp, 192.168.30.11:443->443/tcp
nginx
[root@localhost ~]# docker container exec nginx nginx -t
nginx: the configuration file /etc/nginx/nginx.conf syntax is ok
nginx: configuration file /etc/nginx/nginx.conf test is successful
[root@localhost ~]# docker container exec nginx nginx -s reload
2021/07/12 21:01:41 [notice] 636#636: signal process started
```

再次查看进程

```
[root@localhost ~]# docker exec -it nginx bash
root@2d2637a6ac4d:/# ps ax
  PID TTY      STAT      TIME COMMAND
    1 ?        Ss       0:00 nginx: master process nginx -g daemon off;
   24 ?        S        0:00 nginx: worker process
   25 ?        S        0:00 nginx: worker process
   26 ?        S        0:00 nginx: worker process
   27 ?        S        0:00 nginx: worker process
  623 pts/0    Ss       0:00 bash
  629 pts/0    R+       0:00 ps ax

root@2d2637a6ac4d:/# ps ax
  PID TTY      STAT      TIME COMMAND
    1 ?        Ss       0:00 nginx: master process nginx -g daemon off;
  623 pts/0    Ss       0:00 bash
  642 ?        S        0:00 nginx: worker process
  643 ?        S        0:00 nginx: worker process
  644 ?        S        0:00 nginx: worker process
  645 ?        S        0:00 nginx: worker process
  646 pts/0    R+       0:00 ps ax
```

## 14.5. MySQL

```
sudo mkdir -p /opt/mysql/{data,mysql.d,docker-entrypoint-initdb.d}
```

## docker-compose.yaml

```
version: '3'

services:
  mysql:
    # 镜像名
    image: mysql:latest
    # 容器名
    container_name: mysql
    # 重启策略
    restart: always
    hostname: db.netkiller.cn
    environment:
      # 时区上海
      TZ: Asia/Shanghai
      # root 密码
      MYSQL_ROOT_PASSWORD: test
      # 初始化数据库
      MYSQL_DATABASE: test
      # 初始普通化用户
      MYSQL_USER: test
      # 用户密码
      MYSQL_PASSWORD: test
      # 映射端口
    ports:
      - 3306:3306
    volumes:
      # 挂载数据
      - ./mysql/data/:/var/lib/mysql/
      # 挂载配置
      - ./mysql/conf.d/:/etc/mysql/conf.d/
      # 挂载初始化目录
      - ./mysql/docker-entrypoint-initdb.d/:/docker-entrypoint-
initdb.d/
    command:
      --default-authentication-plugin=mysql_native_password
      --character-set-server=utf8mb4
      --collation-server=utf8mb4_general_ci
      --explicit_defaults_for_timestamp=true
      --lower_case_table_names=1
```

## 登陆测试

```
neo@MacBook-Pro-Neo ~ % docker exec -it mysql mysql -uroot -ptest
mysql: [Warning] Using a password on the command line interface can be
insecure.
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 14
Server version: 8.0.25 MySQL Community Server - GPL

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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input
statement.

mysql>
```

## 14.6. MongoDB

```
$ docker run -d --network some-network --name mongo \
    -e MONGO_INITDB_DATABASE=test \
    -e MONGO_INITDB_ROOT_USERNAME=admin \
    -e MONGO_INITDB_ROOT_PASSWORD=secret \
    mongo

$ docker run -it --rm --network some-network mongo \
    mongo --host mongo \
    -u admin \
    -p secret \
    --authenticationDatabase admin \
    test
> db.getName();
test
```

## 使用 mongodb 用户运行

```

version: '3.9'
services:
  mongodb:
    image: mongo:latest
    container_name: mongo
    hostname: mongo.netkiller.cn
    restart: always
    user: mongodb:mongodb
    privileged: false
    volumes:
      - ./data:/data
    ports:
      - 27017:27017
  environment:
    TZ: Asia/Shanghai
    LANG: en_US.UTF-8
    MONGO_INITDB_DATABASE: admin
    MONGO_INITDB_ROOT_USERNAME: admin
    MONGO_INITDB_ROOT_PASSWORD: admin
  entrypoint: docker-entrypoint.sh mongod
  command:
    --logpath /data/mongod.log

```

```

[www@testing ~]$ sudo cat /var/log/mongodb/mongod.log | grep '"W"'
{"t": {"$date": "2021-08-13T19:54:20.219+08:00"}, "s": "W", "c": "ASIO",
"id": 22601, "ctx": "main", "msg": "No TransportLayer configured during
NetworkInterface startup"}
{"t": {"$date": "2021-08-13T19:54:20.227+08:00"}, "s": "W", "c": "ASIO",
"id": 22601, "ctx": "main", "msg": "No TransportLayer configured during
NetworkInterface startup"}
{"t": {"$date": "2021-08-13T19:54:20.851+08:00"}, "s": "W", "c": "CONTROL",
"id": 22178,
"ctx": "initandlisten", "msg": "/sys/kernel/mm/transparent_hugepage/enabled
is 'always'. We suggest setting it to 'never'", "tags":
["startupWarnings"]}
{"t": {"$date": "2021-08-13T20:01:12.470+08:00"}, "s": "W", "c": "ASIO",
"id": 22601, "ctx": "main", "msg": "No TransportLayer configured during
NetworkInterface startup"}
{"t": {"$date": "2021-08-13T20:01:12.478+08:00"}, "s": "W", "c": "ASIO",
"id": 22601, "ctx": "main", "msg": "No TransportLayer configured during
NetworkInterface startup"}
{"t": {"$date": "2021-08-13T20:01:13.085+08:00"}, "s": "W", "c": "CONTROL",
"id": 22178,
"ctx": "initandlisten", "msg": "/sys/kernel/mm/transparent_hugepage/enabled
is 'always'. We suggest setting it to 'never'", "tags":

```

```
[ "startupWarnings" ]}
```

```
[root@testing ~]# docker exec -it mongo bash
root@mongo:/# cat /sys/kernel/mm/transparent_hugepage/enabled
[always] madvise never
root@mongo:/# cat /sys/kernel/mm/transparent_hugepage/defrag
always defer defer+madvise [madvise] never
```

```
root@mongo:/# echo never > /sys/kernel/mm/transparent_hugepage/defrag
bash: /sys/kernel/mm/transparent_hugepage/defrag: Read-only file system
```

```
[root@testing ~]# if test -f
/sys/kernel/mm/transparent_hugepage/enabled; then
>   echo never > /sys/kernel/mm/transparent_hugepage/enabled
> fi

[root@testing ~]# cat /sys/kernel/mm/transparent_hugepage/enabled
always madvise [never]

[root@testing ~]# docker exec -it mongo bash
root@mongo:/# cat /sys/kernel/mm/transparent_hugepage/defrag
always defer defer+madvise [madvise] never

root@mongo:/# cat /sys/kernel/mm/transparent_hugepage/enabled
always madvise [never]
root@mongo:/# exit
exit
```

解决方案 /etc/rc.local 中加入下面脚本， CentOS 8 Stream 开启 rc.local 请参考《Netkiller Linux 手札》

```
cat <<'EOF'>> /etc/rc.local
if test -f /sys/kernel/mm/transparent_hugepage/enabled; then
    echo never > /sys/kernel/mm/transparent_hugepage/enabled
```

```
fi

if test -f /sys/kernel/mm/transparent_hugepage/defrag; then
    echo never > /sys/kernel/mm/transparent_hugepage/defrag
fi
EOF
```

```
[root@testing ~]# systemctl restart rc-local
```

## 14.7. Node

```
version: '3.9'
services:
  node:
    image: node:latest
    container_name: node
    restart: always
    hostname: node.netkiller.cn
    extra_hosts:
      - db.netkiller.cn:192.168.10.5
      - redis.netkiller.cn:192.168.10.12
    environment:
      TZ: Asia/Shanghai
    ports:
      - 7777:7777
    volumes:
      -
        /opt/netkiller.cn/www.netkiller.cn:/opt/netkiller.cn/www.netkiller.cn
        working_dir: /opt/netkiller.cn/www.netkiller.cn
        entrypoint: node /opt/netkiller.cn/www.netkiller.cn/main.js
```

## 15. Docker FAQ

### 15.1. 通过 IP 找容器

已知 IP 172.17.0.66 我们希望知道那个容器在使用该 IP 地址。

```
$ docker network inspect 50ddb92f378e | grep -A2 -B4 '0\.66'  
"b8f2b71e5715972c910f0876a89dbd9b7000d8fb77580206091e982b2119c4  
7b": {  
        "Name": "nginx",  
        "EndpointID":  
"b7a3aea20619489def16f410c54ed5d857f8cd2062f2c66972f6341de8174e  
d8",  
        "MacAddress": "02:42:ac:11:00:42",  
        "IPv4Address": "172.17.0.66/16",  
        "IPv6Address": ""  
},
```

### 15.2. 常用工具

查看出口IP地址

```
root@production:~# curl ianhazip.com  
root@production:~# curl -4 ianhazip.com  
root@production:~# curl -6 ianhazip.com  
  
root@production:~# curl api.ipify.org  
root@production:~# curl bot.whatismyipaddress.com
```

**Debian/Ubuntu**

### 15.3. 检查 Docker 是否可用

```
docker -v  
docker run ubuntu /bin/echo hello world  
docker stop $(docker ps -a -q)  
docker rm $(docker ps -a -q)  
docker rmi $(docker images -q)
```

### 15.4. Bitnami

<https://github.com/bitnami>

# 第 2 章 Podman

## 1. 安裝 Podman

### 1.1. RockyLinux 安裝 Podman

某些 Redhat 家族的 Linux 是自帶 Podman，例如 Almalinux 9.0，RockyLinux 沒有自帶 podman 需要自己安裝，是方法執行下面的命令

```
[root@netkiller ~]# dnf install -y podman
```

### 1.2. Almalinux 9.0

Almalinux 9.0 自帶 podman

```
systemctl enable podman
```

### 1.3. MacOS 安裝 Podman

MacOS 安裝方法

```
brew install podman
```

### 1.4. 初始話 Podman

## 初始化，启动 Podman

```
podman machine init  
podman machine start
```

## 操作演示

```
neo@MacBook-Pro-M2 ~ % podman machine init  
Downloading VM image: fedora-coreos-37.20221127.2.0-  
qemu.aarch64.qcow2.xz: done  
Extracting compressed file Image resized.  
Machine init complete  
To start your machine run:  
  
    podman machine start  
  
neo@MacBook-Pro-M2 ~ % podman machine start  
Starting machine "podman-machine-default"  
Waiting for VM ...  
Mounting volume... /Users/neo:/Users/neo  
  
This machine is currently configured in rootless mode. If your  
containers  
require root permissions (e.g. ports < 1024), or if you run  
into compatibility  
issues with non-podman clients, you can switch using the  
following command:  
  
    podman machine set --rootful  
  
API forwarding listening on:  
/Users/neo/.local/share/containers/podman/machine/podman-  
machine-default/podman.sock  
  
The system helper service is not installed; the default Docker  
API socket  
address can't be used by podman. If you would like to install  
it run the
```

```
following commands:
```

```
sudo /opt/homebrew/Cellar/podman/4.3.1/bin/podman-mac-
helper install
podman machine stop; podman machine start
```

```
You can still connect Docker API clients by setting DOCKER_HOST
using the
following command in your terminal session:
```

```
export
DOCKER_HOST='unix:///Users/neo/.local/share/containers/podman/m
achine/podman-machine-default/podman.sock'
```

```
Machine "podman-machine-default" started successfully
```

## 1.5. 让 Podman 支持 Docker Compose

启用 socket

```
systemctl enable podman.socket
systemctl start podman.socket
systemctl status podman.socket
```

验证 sock 是否正常工作

```
[root@localhost ~]# curl -H "Content-Type: application/json" --
unix-socket /run/podman/podman.sock http://localhost/_ping
OK
```

此时可以使用 docker compose

```
[root@localhost ~]# ln -s /run/podman/podman.sock  
/var/run/docker.sock
```

## 1.6. 配置 Podman

/etc/containers/registries.conf

## 1.7.

```
$ podman pull maven  
$ podman run -v ~/.m2:/root/.m2 \  
-v /root/bottleneck:/root/bottleneck \  
-w /root/bottleneck \  
maven:latest \  
mvn package
```

## 2. podman 管理

### 2.1. 虚拟机管理

```
$ podman machine init      # 初始化
$ podman machine start     # 启动 podman VM
$ podman machine stop      # 停止VM
$ podman machine list      # 罗列VM
$ podman machine rm          # 删除VM
$ podman machine ssh      # 通过SSH 进入VM, 在终端进行操作
```

### 管理 Podman 系统

```
$ podman system --help

neo@MacBook-Pro-Neo ~> podman system connection list
Name                  URI
Identity              Default
podman-machine-default
ssh://core@localhost:59590/run/user/501/podman/podman.sock
/Users/neo/.ssh/podman-machine-default  true
podman-machine-default-root
ssh://root@localhost:59590/run/podman/podman.sock
/Users/neo/.ssh/podman-machine-default  false

$ podman system df
  TYPE      TOTAL      ACTIVE      SIZE      RECLAMABLE
  Images      29          0    8.931GB  8.931GB (100%)
  Containers      0          0        0B   0B (0%)
  Local Volumes      1          0        0B   0B (0%)

$ podman system info
```

### 2.2. 镜像管理

#### 获取镜像

```
[root@localhost ~]# podman pull busybox
Resolved "busybox" as an alias (/etc/containers/registries.conf.d/000-
shortnames.conf)
Trying to pull docker.io/library/busybox:latest...
Getting image source signatures
Copying blob 45a0cdc5c8d3 done
Copying config 334e4a014c done
Writing manifest to image destination
Storing signatures
334e4a014c81bd4050daa78c7dfd2ae87855e9052721c164ea9d9d9a416ebdd3
```

## 查看镜像

```
[root@localhost ~]# podman image ls
REPOSITORY          TAG      IMAGE ID      CREATED     SIZE
docker.io/library/busybox  latest    334e4a014c81  13 days ago  5.09
MB
```

## 2.3. Registry

```
mkdir -p /var/lib/registry
podman run --privileged -d --name registry -p 5000:5000 -v
/var/lib/registry:/var/lib/registry --restart=always registry:2
```

修改 /etc/containers/registries.conf 配置文件

```
registries = []
改为
registries = ['localhost:5000']
```

## 3. 按例

### 3.1. podman run 用法

```
podman run -v ~/m2:/root/m2 -v  
/root/bottleneck:/root/bottleneck -w /root/bottleneck  
maven:latest mvn package
```

### 3.2. mysql

```
podman pull mysql
```

```
neo@MacBook-Pro-M2 ~ % podman volume create mysql  
mysql

neo@MacBook-Pro-M2 ~ % podman volume ls
DRIVER      VOLUME NAME
local       mysql

neo@MacBook-Pro-M2 ~ % podman run \
-p 3306:3306 \
-e MYSQL_ROOT_PASSWORD=chen \
-v mysql:/var/lib/mysql:rw \
-v /etc/localtime:/etc/localtime:ro \
--name mysql \
-d mysql

neo@MacBook-Pro-M2 ~ % podman exec -it mysql bash
bash-4.4# mysql -h 127.0.0.1 -uroot -pchen
mysql: [Warning] Using a password on the command line interface
can be insecure.
```

```
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 8
Server version: 8.0.31 MySQL Community Server - GPL

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its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current
input statement.

mysql>
```

如果你想修改密码

```
alter user 'root'@'%' identified with mysql_native_password by
'密码';
```

### 3.3. 制作镜像

```
[root@localhost Maven]# podman pull maven:3-openjdk-18
[root@localhost Maven]# podman run -it --rm --name maven --
entrypoint=sh maven:3-openjdk-18 -c "cat
/usr/share/maven/conf/settings.xml" > settings.xml
[root@localhost Maven]# dos2unix settings.xml
```

修改 settings.xml 文件，加入国内镜像

```
[root@localhost Maven]# cat settings.xml
<?xml version="1.0" encoding="UTF-8"?>

<!--
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software distributed under the License is distributed on an
"AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY
KIND, either express or implied. See the License for the
specific language governing permissions and limitations
under the License.
-->

<!--
| This is the configuration file for Maven. It can be
specified at two levels:
|
|   1. User Level. This settings.xml file provides
configuration for a single user,
|           and is normally provided in
${user.home}/.m2/settings.xml.
|
|           NOTE: This location can be overridden
with the CLI option:
|
|               -s /path/to/user/settings.xml
|
|   2. Global Level. This settings.xml file provides
configuration for all Maven
|           users on a machine (assuming they're all
using the same Maven
|           installation). It's normally provided in
${maven.conf}/settings.xml.
|
|           NOTE: This location can be overridden
with the CLI option:
|-->
```

```
          -gs /path/to/global/settings.xml

The sections in this sample file are intended to give you
a running start at
| getting the most out of your Maven installation. Where
appropriate, the default
| values (values used when the setting is not specified)
are provided.
|
|-->
<settings xmlns="http://maven.apache.org/SETTINGS/1.2.0"
           xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance"

xsi:schemaLocation="http://maven.apache.org/SETTINGS/1.2.0
https://maven.apache.org/xsd/settings-1.2.0.xsd">
    <!-- localRepository
        | The path to the local repository maven will use to store
artifacts.
        |
        | Default: ${user.home}/.m2/repository
    <localRepository>/path/to/local/repo</localRepository>
    -->

    <!-- interactiveMode
        | This will determine whether maven prompts you when it
needs input. If set to false,
        | maven will use a sensible default value, perhaps based on
some other setting, for
        | the parameter in question.
        |
        | Default: true
    <interactiveMode>true</interactiveMode>
    -->

    <!-- offline
        | Determines whether maven should attempt to connect to the
network when executing a build.
        | This will have an effect on artifact downloads, artifact
deployment, and others.
        |
        | Default: false
    <offline>false</offline>
    -->
```

```
<!-- pluginGroups
| This is a list of additional group identifiers that will
be searched when resolving plugins by their prefix, i.e.
| when invoking a command line like "mvn prefix:goal".
Maven will automatically add the group identifiers
| "org.apache.maven.plugins" and "org.codehaus.mojo" if
these are not already contained in the list.
|-->
<pluginGroups>
<!-- pluginGroup
| Specifies a further group identifier to use for
plugin lookup.
<pluginGroup>com.your.plugins</pluginGroup>
-->
</pluginGroups>

<!-- proxies
| This is a list of proxies which can be used on this
machine to connect to the network.
| Unless otherwise specified (by system property or
command-line switch), the first proxy
| specification in this list marked as active will be used.
|-->
<proxies>
<!-- proxy
| Specification for one proxy, to be used in connecting
to the network.
|
<proxy>
  <id>optional</id>
  <active>true</active>
  <protocol>http</protocol>
  <username>proxyuser</username>
  <password>proxypass</password>
  <host>proxy.host.net</host>
  <port>80</port>
  <nonProxyHosts>local.net|some.host.com</nonProxyHosts>
</proxy>
-->
</proxies>

<!-- servers
| This is a list of authentication profiles, keyed by the
server-id used within the system.
```

```
| Authentication profiles can be used whenever maven must
make a connection to a remote server.
|-->
<servers>
<!-- server
   | Specifies the authentication information to use when
connecting to a particular server, identified by
   | a unique name within the system (referred to by the
'id' attribute below).
   |
   | NOTE: You should either specify username/password OR
privateKey/passphrase, since these pairings are
   | used together.
   |
<server>
  <id>deploymentRepo</id>
  <username>repouser</username>
  <password>repopwd</password>
</server>
-->

<!-- Another sample, using keys to authenticate.
<server>
  <id>siteServer</id>
  <privateKey>/path/to/private/key</privateKey>
  <passphrase>optional; leave empty if not used.
</passphrase>
</server>
-->
</servers>

<!-- mirrors
   | This is a list of mirrors to be used in downloading
artifacts from remote repositories.
   |
   | It works like this: a POM may declare a repository to use
in resolving certain artifacts.
   | However, this repository may have problems with heavy
traffic at times, so people have mirrored
   | it to several places.
   |
   | That repository definition will have a unique id, so we
can create a mirror reference for that
   | repository, to be used as an alternate download site. The
mirror site will be the preferred
```

```
| server for that repository.  
|-->  
<mirrors>  
<!-- mirror  
| Specifies a repository mirror site to use instead of  
a given repository. The repository that  
| this mirror serves has an ID that matches the  
mirrorOf element of this mirror. IDs are used  
| for inheritance and direct lookup purposes, and must  
be unique across the set of mirrors.  
|  
<mirror>  
    <id>mirrorId</id>  
    <mirrorOf>repositoryId</mirrorOf>  
    <name>Human Readable Name for this Mirror.</name>  
    <url>http://my.repository.com/repo/path</url>  
</mirror>  
<mirror>  
    <id>maven-default-http-blocker</id>  
    <mirrorOf>external:http:*</mirrorOf>  
    <name>Pseudo repository to mirror external repositories  
initially using HTTP.</name>  
    <url>http://0.0.0.0/</url>  
    <blocked>true</blocked>  
</mirror>  
-->  
<mirror>  
    <id>aliyunmaven</id>  
    <mirrorOf>*</mirrorOf>  
    <name>aliyun</name>  
    <url>https://maven.aliyun.com/repository/public</url>  
</mirror>  
</mirrors>  
  
<!-- profiles  
| This is a list of profiles which can be activated in a  
variety of ways, and which can modify  
| the build process. Profiles provided in the settings.xml  
are intended to provide local machine-  
| specific paths and repository locations which allow the  
build to work in the local environment.  
|  
| For example, if you have an integration testing plugin -  
like cactus - that needs to know where  
| your Tomcat instance is installed, you can provide a
```

```
variable here such that the variable is
| dereferenced during the build process to configure the
cactus plugin.

|
| As noted above, profiles can be activated in a variety of
ways. One way - the activeProfiles
| section of this document (settings.xml) - will be
discussed later. Another way essentially
| relies on the detection of a system property, either
matching a particular value for the property,
| or merely testing its existence. Profiles can also be
activated by JDK version prefix, where a
| value of '1.4' might activate a profile when the build is
executed on a JDK version of '1.4.2_07'.
| Finally, the list of active profiles can be specified
directly from the command line.

|
| NOTE: For profiles defined in the settings.xml, you are
restricted to specifying only artifact
| repositories, plugin repositories, and free-form
properties to be used as configuration
| variables for plugins in the POM.

|
|-->
<profiles>
<!-- profile
    | Specifies a set of introductions to the build
process, to be activated using one or more of the
    | mechanisms described above. For inheritance purposes,
and to activate profiles via <activatedProfiles/>
    | or the command line, profiles have to have an ID that
is unique.

|
    | An encouraged best practice for profile
identification is to use a consistent naming convention
    | for profiles, such as 'env-dev', 'env-test', 'env-
production', 'user-jdcasey', 'user-brett', etc.
    | This will make it more intuitive to understand what
the set of introduced profiles is attempting
    | to accomplish, particularly when you only have a list
of profile id's for debug.

|
    | This profile example uses the JDK version to trigger
activation, and provides a JDK-specific repo.

<profile>
```

```

<id>jdk-1.4</id>

<activation>
<jdk>1.4</jdk>
</activation>

<repositories>
<repository>
    <id>jdk14</id>
    <name>Repository for JDK 1.4 builds</name>
    <url>http://www.myhost.com/maven/jdk14</url>
    <layout>default</layout>
    <snapshotPolicy>always</snapshotPolicy>
</repository>
</repositories>
</profile>
-->

<!--
| Here is another profile, activated by the system
property 'target-env' with a value of 'dev',
| which provides a specific path to the Tomcat
instance. To use this, your plugin configuration
| might hypothetically look like:

...
<plugin>
    <groupId>org.myco.myplugins</groupId>
    <artifactId>myplugin</artifactId>

    <configuration>
        <tomcatLocation>${tomcatPath}</tomcatLocation>
    </configuration>
</plugin>
...

NOTE: If you just wanted to inject this configuration
whenever someone set 'target-env' to
| anything, you could just leave off the <value/>
inside the activation-property.
|
<profile>
    <id>env-dev</id>

    <activation>

```

```
<property>
    <name>target-env</name>
    <value>dev</value>
</property>
</activation>

<properties>
    <tomcatPath>/path/to/tomcat/instance</tomcatPath>
</properties>
</profile>
-->
</profiles>

<!-- activeProfiles
| List of profiles that are active for all builds.
|
<activeProfiles>
<activeProfile>alwaysActiveProfile</activeProfile>
<activeProfile>anotherAlwaysActiveProfile</activeProfile>
</activeProfiles>
-->
</settings>
```

## 创建 Dockerfile 文件

```
[root@localhost Maven]# cat Dockerfile
FROM maven:3-openjdk-18

COPY settings.xml /root/.m2/settings.xml
```

## 制作 Maven 镜像

```
[root@localhost Maven]# podman build -t
"docker.io/netkiller/maven:3-openjdk-18" .

[root@localhost Maven]# podman image ls | grep maven
```

```
docker.io/netkiller/maven      3-openjdk-18  3951f6d3aa19  50
seconds ago  829 MB
docker.io/library/maven        latest       0f909120a578  3
weeks ago   543 MB
docker.io/library/maven        3-openjdk-18  1e86120a0116  3
weeks ago   829 MB

[root@localhost Maven]# podman login docker.io/netkiller
Username: netkiller
Password:
Login Succeeded!

[root@localhost Maven]# podman push
docker.io/netkiller/maven:3-openjdk-18
```

## 使用自制的 Maven 镜像

```
[root@localhost ~]# podman run -it --rm --name maven -v
~/.m2:/root/.m2 -v /root/bottleneck:/root/bottleneck -w
/root/bottleneck docker.io/netkiller/maven:3-openjdk-18 mvn
package
[INFO] Scanning for projects...
[INFO]
[INFO] -----< cn.netkiller:bottleneck >-----
-----
[INFO] Building bottleneck 0.0.1-SNAPSHOT
[INFO] -----[ jar ]-----
-----
[INFO]
[INFO] --- maven-resources-plugin:3.3.0:resources (default-
resources) @ bottleneck ---
[INFO] Copying 1 resource
[INFO] Copying 4 resources
[INFO]
[INFO] --- maven-compiler-plugin:3.10.1:compile (default-
compile) @ bottleneck ---
[INFO] Changes detected - recompiling the module!
[INFO] Compiling 8 source files to
/root/bottleneck/target/classeskm
[INFO]
[INFO] --- maven-resources-plugin:3.3.0:testResources (default-
```

```
testResources) @ bottleneck ---  
[INFO] skip non existing resourceDirectory  
/root/bottleneck/src/test/resources  
[INFO]  
[INFO] --- maven-compiler-plugin:3.10.1:testCompile (default-testCompile) @ bottleneck ---  
[INFO] No sources to compile  
[INFO]  
[INFO] --- maven-surefire-plugin:2.22.2:test (default-test) @ bottleneck ---  
[INFO] Tests are skipped.  
[INFO]  
[INFO] --- maven-jar-plugin:3.3.0:jar (default-jar) @ bottleneck ---  
[INFO] Building jar: /root/bottleneck/target/bottleneck-0.0.1-SNAPSHOT.jar  
[INFO]  
[INFO] --- spring-boot-maven-plugin:3.0.1:repackage (repackage) @ bottleneck ---  
[INFO] Replacing main artifact with repackaged archive  
[INFO] -----  
-----  
[INFO] BUILD SUCCESS  
[INFO] -----  
-----  
[INFO] Total time: 1.546 s  
[INFO] Finished at: 2023-01-01T11:58:11Z  
[INFO] -----  
-----
```

# 部分 I. Kubernetes

# 第 3 章 Minikube

## 1. CentOS 8 安装 minikube

### 1.1. CentOS

执行下面命令检查服务器是否开启虚拟化技术

```
egrep --color 'vmx|svm' /proc/cpuinfo
```

如果没有任何输出，请重启服务器进入 BIOS 启用 VT-X 或 AMD-v

```
curl -LO https://storage.googleapis.com/minikube/releases/latest/minikube-linux-amd64 \
&& install minikube-linux-amd64 /usr/local/bin/minikube
```

尝试运行 minikube 如果输出帮助信息表示安装成功

```
[root@localhost ~]# minikube version
minikube version: v1.13.0
commit: 0c5e9de4ca6f9c55147ae7f90af97eff5befef5f-dirty
```

```
echo "1" > /proc/sys/net/bridge/bridge-nf-call-iptables
```

dnf 安装 kubectl

```
cat <<EOF > /etc/yum.repos.d/kubernetes.repo
[kubernetes]
name=Kubernetes
baseurl=https://packages.cloud.google.com/yum/repos/kubernetes-el7-x86_64
enabled=1
gpgcheck=1
repo_gpgcheck=1
```

```
gpgkey=https://packages.cloud.google.com/yum/doc/yum-key.gpg  
https://packages.cloud.google.com/yum/doc/rpm-package-key.gpg  
EOF
```

```
[root@localhost ~]# dnf install kubectl
```

## 二进制安装 kubectl

```
curl -LO "https://storage.googleapis.com/kubernetes-release/release/$(curl -s  
https://storage.googleapis.com/kubernetes-  
release/release/stable.txt)/bin/linux/amd64/kubectl" \  
    && install kubectl /usr/local/bin/kubectl
```

## 无虚拟机

如果你不想安装虚拟机

```
adduser docker  
su - docker  
sudo usermod -aG docker $USER && newgrp docker
```

```
[docker@localhost ~]$ minikube start --driver=docker  
* minikube v1.13.0 on Centos 8.2.2004  
* Using the docker driver based on user configuration  
  
X Requested memory allocation (1694MB) is less than the recommended minimum  
2000MB. Deployments may fail.  
  
X The requested memory allocation of 1694MiB does not leave room for system  
overhead (total system memory: 1694MiB). You may face stability issues.  
* Suggestion: Start minikube with less memory allocated: 'minikube start --  
memory=1694mb'  
  
* Starting control plane node minikube in cluster minikube  
* Pulling base image ...  
* Downloading Kubernetes v1.19.0 preload ...  
  > preloaded-images-k8s-v6-v1.19.0-docker-overlay2-amd64.tar.lz4: 486.28 MiB
```

## 1.2. Mac OS

检查硬件是否支持虚拟化

```
iMac:Linux neo$ sysctl -a | grep -E --color 'machdep.cpu.features|VMX'
machdep.cpu.features: FPU VME DE PSE TSC MSR PAE MCE CX8 APIC SEP MTRR PGE MCA
CMOV PAT PSE36 CLFSH DS ACPI MMX FXSR SSE SSE2 SS HTT TM PBE SSE3 PCLMULQDQ
DTES64 MON DSCPL VMX SMX EST TM2 SSSE3 CX16 TPR PDCM SSE4.1 SSE4.2 x2APIC POPCNT
AES PCID XSAVE OSXSAVE TSCTMR AVX1.0
```

```
$ brew install hyperkit
$ brew install minikube
$ brew install kubectl
$ brew install kubernetes-helm
```

```
neo@MacBook-Pro-Neo ~ % minikube start
😊 minikube v1.13.1 on Darwin 11.0
🆕 Kubernetes 1.19.2 is now available. If you would like to upgrade, specify: --
--kubernetes-version=v1.19.2
💡 Using the hyperkit driver based on existing profile
👍 Starting control plane node minikube in cluster minikube
🔄 Restarting existing hyperkit VM for "minikube" ...
❗ This VM is having trouble accessing https://k8s.gcr.io
💡 To pull new external images, you may need to configure a proxy:
https://minikube.sigs.k8s.io/docs/reference/networking/proxy/
🌐 Preparing Kubernetes v1.19.0 on Docker 19.03.12 ...
🔍 Verifying Kubernetes components...
⭐ Enabled addons: dashboard, default-storageclass, storage-provisioner
🎉 Done! kubectl is now configured to use "minikube" by default
```

有些老系统可能不支持 hyperkit，需要virtualbox。

```
$ brew cask install virtualbox
$ minikube start --vm-driver=virtualbox
$ minikube dashboard
```

## 检查 minikube 启动状态

```
Neo-iMac:~ neo$ docker container inspect minikube --format="{{.State.Status}}  
running
```

## 2. Quickstart

启动

```
minikube start
```

运行一个 echoserver 镜像

```
kubectl run hello-minikube --image=k8s.gcr.io/echoserver:1.4 --  
port=8080  
kubectl expose deployment hello-minikube --type=NodePort  
minikube service hello-minikube
```

查询 echoserver 访问地址

```
minikube service hello-minikube --url
```

在浏览器中访问查询到的网址

停止并删除镜像

```
minikube stop  
minikube delete
```

## 例 3.1. minikube 操作演示

### 快速开始使用 minikube 运行一个镜像

```
[root@localhost ~]# kubectl run hello-minikube --image=k8s.gcr.io/echoserver:1.4 --port=8080
kubectl run --generator=deployment/apps.v1 is DEPRECATED and will be removed in a future version. Use kubectl run --generator=run-pod/v1 or kubectl create instead.
deployment.apps/hello-minikube created

[root@localhost ~]# kubectl expose deployment hello-minikube --type=NodePort
service/hello-minikube exposed

[root@localhost ~]# minikube service hello-minikube
Opening kubernetes service default/hello-minikube in default browser...

[root@localhost ~]# kubectl get pod
NAME                      READY   STATUS    RESTARTS
AGE
hello-minikube-5c856cbf98-6vfpv   1/1     Running   0
6m59s

[root@localhost ~]# minikube service hello-minikube --url
http://172.16.0.121:30436

[root@localhost ~]# curl http://172.16.0.121:30436
CLIENT VALUES:
client_address=172.17.0.1
command=GET
real_path=
query=nil
request_version=1.1
request_uri=http://172.16.0.121:8080/

SERVER VALUES:
server_version=nginx: 1.10.0 - lua: 10001

HEADERS RECEIVED:
accept=/*
```

```
host=172.16.0.121:30436
user-agent=curl/7.29.0
BODY:
-no body in request-
```

### 3. minikube 命令

```
[root@localhost ~]# minikube
Minikube is a CLI tool that provisions and manages single-node Kubernetes clusters optimized
for development workflows.

Usage:
  minikube [command]

Available Commands:
  addons      Modify minikube's kubernetes addons
  cache       Add or delete an image from the local cache.
  completion   Outputs minikube shell completion for the given shell (bash or zsh)
  config       Modify minikube config
  dashboard    Access the kubernetes dashboard running within the minikube cluster
  delete       Deletes a local kubernetes cluster
  docker-env   Sets up docker env variables; similar to '$(docker-machine env)'
  help        Help about any command
  ip          Retrieves the IP address of the running cluster
  logs        Gets the logs of the running instance, used for debugging minikube, not user
  code
  mount       Mounts the specified directory into minikube
  profile     Profile sets the current minikube profile
  service     Gets the kubernetes URL(s) for the specified service in your local cluster
  ssh         Log into or run a command on a machine with SSH; similar to 'docker-machine
  ssh'
  ssh-key     Retrieve the ssh identity key path of the specified cluster
  start       Starts a local kubernetes cluster
  status      Gets the status of a local kubernetes cluster
  stop        Stops a running local kubernetes cluster
  tunnel      tunnel makes services of type LoadBalancer accessible on localhost
  update-check Print current and latest version number
  update-context Verify the IP address of the running cluster in kubeconfig.
  version     Print the version of minikube

Flags:
      --alsologtostderr           log to standard error as well as files
      -b, --bootstrapper string    The name of the cluster bootstrapper that will set up
the kubernetes cluster. (default "kubeadm")
      -h, --help                  help for minikube
      --log_backtrace_at traceLocation  when logging hits line file:N, emit a stack trace
(default :0)
      --log_dir string            If non-empty, write log files in this directory
      --logtostderr               log to standard error instead of files
      -p, --profile string        The name of the minikube VM being used.
                                    This can be modified to allow for multiple
minikube instances to be run independently (default "minikube")
      --stderrthreshold severity   logs at or above this threshold go to stderr (default
2)
      -v, --v Level               log level for V logs
      --vmmodule moduleSpec       comma-separated list of pattern=N settings for file-
filtered logging

Use "minikube [command] --help" for more information about a command.
```

#### 3.1. minikube ip 地址

```
[docker@localhost ~]$ minikube ip
```

```
192.168.58.2
```

```
kubectl get nodes -o jsonpath='{.items[*].status.addresses[ ].address}'
```

### 3.2. 启动 minikube

虚拟机驱动

```
--vm-driver=none
```

```
minikube start --vm-driver=none
```

开启GPU

```
minikube start --vm-driver kvm2 --gpu
```

日志输出级别

指定日志输出级别

```
minikube start --v=7
```

CPU 和 内存分配

```
minikube start --memory 8000 --cpus 2
```

指定 kubernetes 版本

```
minikube start --memory 8000 --cpus 2 --kubernetes-version v1.6.0
```

配置启动项

```
minikube start --extra-config=apiserver.v=10 --extra-config=kubelet.max-pods=100
```

### 指定 registry-mirror 镜像

```
minikube start --registry-mirror=https://registry.docker-cn.com  
minikube start --image-mirror-country=cn --registry-mirror="https://docker.mirrors.ustc.edu.cn"  
--insecure-registry="127.0.0.1:5000"  
minikube start --image-mirror-country=cn --registry-mirror="https://docker.mirrors.ustc.edu.cn"  
--insecure-registry="192.168.0.0/24"
```

### 指定下载镜像

```
minikube start --image-mirror-country=cn --image-repository=registry.cn-  
hangzhou.aliyuncs.com/google_containers
```

```
# 从阿里云下载 virtualbox 镜像  
minikube start --vm-driver='virtualbox' --image-mirror-country cn \  
--iso-url=https://kubernetes.oss-cn-hangzhou.aliyuncs.com/minikube/iso/minikube-v1.9.0.iso  
\  
--registry-mirror=https://docker.mirrors.ustc.edu.cn  
  
minikube start --vm-driver=virtualbox \  
--image-mirror-country cn \  
--registry-mirror=https://docker.mirrors.ustc.edu.cn \  
--image-repository=registry.aliyuncs.com/google_containers \  
--insecure-registry=192.168.0.10:5000 //访问宿主机的私有docker仓库
```

### Enabling Unsafe Sysctls

```
minikube start --extra-config="kubelet.allowed-unsafe-sysctls=kernel.msg*,net.core.somaxconn".
```

### 使用 CRI-O 容易

```
minikube start --container-runtime=cri-o --vm-driver=none
```

### 启动演示

```
iMac:~ neo$ minikube start --container-runtime=cri-o
🍺 Darwin 10.13.6 上的 minikube v1.15.0
🆕 Kubernetes 1.19.4 is now available. If you would like to upgrade, specify: --kubernetes-
version=v1.19.4
⚡ 根据现有的配置文件使用 hyperkit 驱动程序
👍 Starting control plane node minikube in cluster minikube
🔄 Restarting existing hyperkit VM for "minikube" ...
📦 正在 CRI-O 1.17.3 中准备 Kubernetes v1.19.2...
🔧 Configuring bridge CNI (Container Networking Interface) ...
🌐 Verifying Kubernetes components...
🌟 Enabled addons: storage-provisioner, dashboard, default-storageclass
🌟 Done! kubectl is now configured to use "minikube" cluster and "" namespace by default
```

### 3.3. 停止 minikube

```
[root@localhost ~]# minikube stop
Stopping local Kubernetes cluster...
Machine stopped.
```

### 3.4. Docker 环境变量

```
neo@MacBook-Pro-Neo ~ % minikube docker-env
export DOCKER_TLS_VERIFY="1"
export DOCKER_HOST="tcp://192.168.64.3:2376"
export DOCKER_CERT_PATH="/Users/neo/.minikube/certs"
export MINIKUBE_ACTIVE_DOCKERD="minikube"

# To point your shell to minikube's docker-daemon, run:
# eval $(minikube -p minikube docker-env)
```

设置环境变量

```
# eval $(minikube docker-env)
# eval $(minikube -p minikube docker-env)
```

### 3.5. SSH

```
neo@MacBook-Pro-Neo ~ % minikube ssh

$$\begin{array}{c} ( ) ( ) ( ) ( ) ( ) ( ) \\ ( ) ( ) ( ) ( ) ( ) ( ) \\ ( ) ( ) ( ) ( ) ( ) ( ) \end{array}$$

$
```

### 3.6. 缓存镜像

```
# cache a image into $HOME/.minikube/cache/images  
  
$ minikube cache add ubuntu:16.04  
$ minikube cache add redis:3  
  
# list cached images  
$ minikube cache list  
redis:3  
ubuntu:16.04  
  
# delete cached images  
$ minikube cache delete ubuntu:16.04  
$ minikube cache delete $(minikube cache list)
```

### 3.7. 清理 minikube

```
minikube delete  
rm ~/.minikube  
minikube start
```

### 3.8. Kubernetes 控制面板

Dashboard是基于Web的Kubernetes管理界面。使用下面的命令启动:

```
minikube dashboard
```

查询控制面板访问地址

```
$ minikube dashboard --url  
http://192.168.3.14:30000
```

### 3.9. service

列出所有服务

```
Neo-iMac:~ neo$ minikube service list  
|-----|-----|-----|-----|  
| NAMESPACE |     NAME      | TARGET PORT | URL   |  
|-----|-----|-----|-----|  
| default   | kubernetes | No node port |
```

default	nginx	nginx	80	
ingress-nginx	ingress-nginx-controller	http/80 https/443		
ingress-nginx	ingress-nginx-controller-admission	No node port		
kube-system	kube-dns	No node port		
kubernetes-dashboard	dashboard-metrics-scraper	No node port		
kubernetes-dashboard	kubernetes-dashboard	No node port		

查看指定服务

```
Neo-iMac:~ neo$ minikube service nginx
|-----|-----|-----|-----|
| NAMESPACE | NAME | TARGET PORT | URL |
|-----|-----|-----|-----|
| default | nginx | 80 | http://192.168.49.2:30330 |
|-----|-----|-----|-----|
💡 Starting tunnel for service nginx.
|-----|-----|-----|-----|
| NAMESPACE | NAME | TARGET PORT | URL |
|-----|-----|-----|-----|
| default | nginx | | http://127.0.0.1:55815 |
|-----|-----|-----|-----|
⚠️ Opening service default/nginx in default browser...
! Because you are using a Docker driver on darwin, the terminal needs to be open to run it.
```

查看服务的网址

```
[root@localhost ~]# minikube service hello-minikube --url
http://172.16.0.121:30436
```

### 3.10. 查看日志

```
minikube logs -v10
```

### 3.11. 查看 Docker 环境变量

```
minikube docker-env
```

```
Neo-iMac:~ neo$ minikube docker-env
export DOCKER_TLS_VERIFY="1"
export DOCKER_HOST="tcp://127.0.0.1:54734"
export DOCKER_CERT_PATH="/Users/neo/.minikube/certs"
export MINIKUBE_ACTIVE_DOCKERD="minikube"

# To point your shell to minikube's docker-daemon, run:
# eval $(minikube -p minikube docker-env)
```

### 3.12. profile

```
minikube profile demo  
minikube start -p demo --memory=8192 --cpus=6 --disk-size=50g
```

### 3.13. addons

查看所有插件

ADDON NAME	PROFILE	STATUS
ambassador	minikube	disabled
dashboard	minikube	enabled ✓
default-storageclass	minikube	enabled ✓
efk	minikube	disabled
freshpod	minikube	disabled
gcp-auth	minikube	disabled
gvisor	minikube	disabled
helm-tiller	minikube	disabled
ingress	minikube	disabled
ingress-dns	minikube	disabled
istio	minikube	disabled
istio-provisioner	minikube	disabled
kubevirt	minikube	disabled
logviewer	minikube	disabled
metallb	minikube	disabled
metrics-server	minikube	disabled
nvidia-driver-installer	minikube	disabled
nvidia-gpu-device-plugin	minikube	disabled
olm	minikube	disabled
pod-security-policy	minikube	disabled
registry	minikube	disabled
registry-aliases	minikube	disabled
registry-creds	minikube	disabled
storage-provisioner	minikube	enabled ✓
storage-provisioner-gluster	minikube	disabled

启用 addons

```
minikube addons enable heapster  
minikube addons enable ingress
```

启用 WebUI

```
[root@localhost ~]# minikube addons enable dashboard
dashboard was successfully enabled
[root@localhost ~]# minikube addons list | grep dashboard
- dashboard: enabled
```

## 查看 addons 列表

```
[root@localhost ~]# minikube addons list
- addon-manager: enabled
- dashboard: enabled
- default-storageclass: enabled
- efk: disabled
- freshpod: disabled
- gvisor: disabled
- heapster: disabled
- ingress: disabled
- kube-dns: disabled
- metrics-server: disabled
- nvidia-driver-installer: disabled
- nvidia-gpu-device-plugin: disabled
- registry: disabled
- registry-creds: disabled
- storage-provisioner: enabled
- storage-provisioner-gluster: disabled
```

## dashboard

```
Neo-iMac:~ neo$ minikube addons enable dashboard
  ■ Using image registry.cn-hangzhou.aliyuncs.com/google_containers/metrics-scraper:v1.0.7
  ■ Using image registry.cn-hangzhou.aliyuncs.com/google_containers/dashboard:v2.3.1
💡 Some dashboard features require the metrics-server addon. To enable all features please
run:

      minikube addons enable metrics-server

💡 The 'dashboard' addon is enabled
```

```
Neo-iMac:~ neo$ minikube dashboard
🚀 Verifying dashboard health ...
🚀 Launching proxy ...
🚀 Verifying proxy health ...
🚀 Opening http://127.0.0.1:62433/api/v1/namespaces/kubernetes-
dashboard/services/http:kubernetes-dashboard:/proxy/ in your default browser...
```

## 开启 registry 私有库

```
# enable the registry addon
$ minikube addons enable registry

$ minikube start

# use the minikube docker daemon from the host
$ eval $(minikube docker-env)

# get the ip of the registry endpoint
$ kubectl -n kube-system get svc registry -o jsonpath=".spec.clusterIP"
10.0.0.240
```

```
{
  "insecure-registries" : ["10.0.0.240"]
}
```

```
$ minikube ssh
$ docker pull busybox
$ docker tag busybox 10.0.0.240/busybox

# or

# build and push to insecure registry
$ docker build -t 10.0.0.240/busybox .
$ docker push 10.0.0.240/busybox
```

## 启用 ingress

```
Neo-iMac:~ neo$ minikube addons enable ingress
💡 After the addon is enabled, please run "minikube tunnel" and your ingress resources would
be available at "127.0.0.1"
  ■ Using image registry.cn-hangzhou.aliyuncs.com/google_containers/kube-webhook-
certgen:v1.1.1
  ■ Using image registry.cn-hangzhou.aliyuncs.com/google_containers/kube-webhook-
certgen:v1.1.1
  ■ Using image registry.cn-hangzhou.aliyuncs.com/google_containers/nginx-ingress-
controller:v1.0.4
🌐 Verifying ingress addon...
🌟 The 'ingress' addon is enabled
```

运行一个简单的demo

```
运行 nginx 服务
kubectl run nginx --image=nginx --port=80
暴露服务
kubectl expose deployment nginx --port=80 --target-port=80
```

```
创建ingress
yaml 定义 ingress.yaml

apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: nginx
spec:
  rules:
  - host: www.netkiller.cn
    http:
      paths:
      - path: /
        backend:
          serviceName: nginx
          servicePort: 80

运行
kubectl apply -f ingress.yaml

配置本机host获取minikube ip

[docker@localhost ~]$ minikube ip
192.168.58.2

配置 /etc/hosts 文件
192.168.58.2 www.netkiller.cn
```

访问 <http://www.netkiller.cn>

### 3.14. SSH

--vm-driver=none 不支持 ssh

```
[root@localhost ~]# minikube ssh
'none' driver does not support 'minikube ssh' command
```

### 3.15. 查看IP地址

```
[root@localhost ~]# minikube ip
172.16.0.121
```

### 3.16. 镜像管理

```
neo@MacBook-Pro-Neo ~ % minikube image ls
registry.cn-hangzhou.aliyuncs.com/google_containers/storage-provisioner:v5
registry.cn-hangzhou.aliyuncs.com/google_containers/pause:3.2
registry.cn-hangzhou.aliyuncs.com/google_containers/metrics-scraper:v1.0.4
registry.cn-hangzhou.aliyuncs.com/google_containers/kube-scheduler:v1.20.7
registry.cn-hangzhou.aliyuncs.com/google_containers/kube-proxy:v1.20.7
registry.cn-hangzhou.aliyuncs.com/google_containers/kube-controller-manager:v1.20.7
registry.cn-hangzhou.aliyuncs.com/google_containers/kube-apiserver:v1.20.7
```

```
registry.cn-hangzhou.aliyuncs.com/google_containers/etcd:3.4.13-0
registry.cn-hangzhou.aliyuncs.com/google_containers/dashboard:v2.1.0
registry.cn-hangzhou.aliyuncs.com/google_containers/coredns:1.7.0
docker.io/netkiller/flask:latest
```

### 3.17. kubectl

```
neo@MacBook-Pro-Neo ~ % minikube kubectl -- get pods -A
  > kubectl.sha256: 64 B / 64 B [-----] 100.00% ? p/s 0s
  > kubectl: 44.08 MiB / 44.08 MiB [-----] 100.00% 5.30 MiB p/s 8.5s
  NAMESPACE      NAME          READY   STATUS
  RESTARTS     AGE
ingress-nginx  ingress-nginx-admission-create-vzk2b    0/1     ImagePullBackOff  0
118d
ingress-nginx  ingress-nginx-admission-patch-65b85    0/1     ImagePullBackOff  0
118d
ingress-nginx  ingress-nginx-controller-7f79776f95-ncqkn 0/1     ContainerCreating  0
118d
kube-system    coredns-54d67798b7-cnjgw        1/1     Running       2
121d
kube-system    etcd-minikube           1/1     Running       2
121d
kube-system    kube-apiserver-minikube      1/1     Running       2
121d
kube-system    kube-controller-manager-minikube 1/1     Running       2
121d
kube-system    kube-proxy-tr8fd          1/1     Running       2
121d
kube-system    kube-scheduler-minikube      1/1     Running       2
121d
kube-system    storage-provisioner        1/1     Running       2
121d
```

## 4. Minikube 案例演示

## 5. FAQ

### 5.1. This computer doesn't have VT-X/AMD-v enabled. Enabling it in the BIOS is mandatory

检查一下 BIOS 是否开启 VT-X/AMD-v

如果在虚拟机安装 Minikube 也会遇到这个问题。可以使用 --vm-driver=none 参数启动。

```
neo@ubuntu:~$ sudo minikube start --vm-driver=none
```

### 5.2. ERROR FileContent--proc-sys-net-bridge-bridge-nf-call-iptables

解决方法

```
echo "1" > /proc/sys/net/bridge/bridge-nf-call-iptables
```

然后在 minikube start

### 5.3. ERROR ImagePull

[ERROR ImagePull]: failed to pull image k8s.gcr.io/pause:3.1: output: 3.1: Pulling from pause  
Get https://k8s.gcr.io/v2/pause/manifests/sha256:59eec8837a4d942cc19a52b8c09ea75121acc38114  
a2c68b98983ce9356b8610: net/http: TLS handshake timeout

更换镜像再重试

```
[root@localhost ~]# minikube start --vm-driver=none --registry-mirror=https://registry.docker-cn.com
```

### 5.4. 证书已存在错误

启动提示如下错误，一般出现这种错误是因为 minikube stop, minikube delete 后再重启 minikube start

```
error execution phase kubeconfig/admin: a kubeconfig file  
"/etc/kubernetes/admin.conf" exists already but has got the wrong CA cert  
error execution phase kubeconfig/kubelet: a kubeconfig file  
"/etc/kubernetes/kubelet.conf" exists already but has got the wrong CA cert  
error execution phase kubeconfig/controller-manager: a kubeconfig file  
"/etc/kubernetes/controller-manager.conf" exists already but has got the wrong  
CA cert  
error execution phase kubeconfig/scheduler: a kubeconfig file  
"/etc/kubernetes/scheduler.conf" exists already but has got the wrong CA cert
```

## 解决方法

```
[root@localhost ~]# mv /etc/kubernetes/admin.conf  
/etc/kubernetes/admin.conf.backup  
[root@localhost ~]# mv /etc/kubernetes/kubelet.conf  
/etc/kubernetes/kubelet.conf.backup  
[root@localhost ~]# mv /etc/kubernetes/controller-manager.conf  
/etc/kubernetes/controller-manager.conf.backup  
[root@localhost ~]# mv /etc/kubernetes/scheduler.conf  
/etc/kubernetes/scheduler.conf.backup
```

现在启动 minikube start 不会再出错

```
[root@localhost ~]# minikube start --vm-driver=none  
Starting local Kubernetes v1.13.2 cluster...  
Starting VM...  
Getting VM IP address...  
Moving files into cluster...  
Setting up certs...  
Connecting to cluster...  
Setting up kubeconfig...  
Stopping extra container runtimes...  
Starting cluster components...  
Verifying kubelet health ...  
Verifying apiserver health ...  
Kubectl is now configured to use the cluster.  
=====  
WARNING: IT IS RECOMMENDED NOT TO RUN THE NONE DRIVER ON PERSONAL WORKSTATIONS  
The 'none' driver will run an insecure kubernetes apiserver as root that  
may leave the host vulnerable to CSRF attacks  
  
When using the none driver, the kubectl config and credentials generated will be
```

```
root owned and will appear in the root home directory.  
You will need to move the files to the appropriate location and then set the  
correct permissions. An example of this is below:
```

```
sudo mv /root/.kube $HOME/.kube # this will write over any previous  
configuration
```

```
sudo chown -R $USER $HOME/.kube  
sudo chgrp -R $USER $HOME/.kube
```

```
sudo mv /root/.minikube $HOME/.minikube # this will write over any  
previous configuration
```

```
sudo chown -R $USER $HOME/.minikube  
sudo chgrp -R $USER $HOME/.minikube
```

```
This can also be done automatically by setting the env var  
CHANGE_MINIKUBE_NONE_USER=true  
Loading cached images from config file.
```

```
Everything looks great. Please enjoy minikube!
```

## 5.5. http: server gave HTTP response to HTTPS client

问题原因，使用私有 registry 由于没有 HTTPS 导致 kubectl 使用 https 去访问私有 registry。

```
Failed to pull image "192.168.3.85:5000/netkiller/config:latest": rpc error:  
code = Unknown desc = Error response from daemon: Get  
https://192.168.3.85:5000/v2/: http: server gave HTTP response to HTTPS client
```

minikube 并不会使用 docker 配置文件中的 insecure-registry 配置项

解决办法

```
minikube start --insecure-registry=127.0.0.1:5000
```

或指定网段

```
minikube start --insecure-registry "10.0.0.0/24"
```

## 5.6. provided port is not in the valid range. The range of valid ports is 30000-32767

```
iMac:kubernetes neo$ kubectl create -f redis/redis.yml
configmap/redis-config created
deployment.apps/redis created
The Service "redis" is invalid: spec.ports[0].nodePort: Invalid value: 6379:
provided port is not in the valid range. The range of valid ports is 30000-32767
```

编辑kube-apiserver.yaml文件

```
$ minikube ssh
$ sudo vi /etc/kubernetes/manifests/kube-apiserver.yaml
```

增加kube-apiserver的启动配置项

```
--service-node-port-range=1024-65535
```

```
$ sudo cat /etc/kubernetes/manifests/kube-apiserver.yaml
apiVersion: v1
kind: Pod
metadata:
  annotations:
    kubeadm.kubernetes.io/kube-apiserver.advertise-address.endpoint:
    192.168.64.5:8443
  creationTimestamp: null
  labels:
    component: kube-apiserver
    tier: control-plane
    name: kube-apiserver
    namespace: kube-system
spec:
  containers:
  - command:
    - kube-apiserver
    - --advertise-address=192.168.64.5
    - --allow-privileged=true
    - --authorization-mode=Node,RBAC
    - --client-ca-file=/var/lib/minikube/certs/ca.crt
    - --enable-admission-
```

```
plugins=NamespaceLifecycle,LimitRanger,ServiceAccount,DefaultStorageClass,DefaultTolerationSeconds,NodeRestriction,MutatingAdmissionWebhook,ValidatingAdmissionWebhook,ResourceQuota
    - --enable-bootstrap-token-auth=true
    - --etcd-cafile=/var/lib/minikube/certs/etcd/ca.crt
    - --etcd-certfile=/var/lib/minikube/certs/apiserver-etcd-client.crt
    - --etcd-keyfile=/var/lib/minikube/certs/apiserver-etcd-client.key
    - --etcd-servers=https://127.0.0.1:2379
    - --insecure-port=0
    - --kubelet-client-certificate=/var/lib/minikube/certs/apiserver-kubelet-client.crt
        - --kubelet-client-key=/var/lib/minikube/certs/apiserver-kubelet-client.key
    - --kubelet-preferred-address-types=InternalIP,ExternalIP,Hostname
    - --proxy-client-cert-file=/var/lib/minikube/certs/front-proxy-client.crt
    - --proxy-client-key-file=/var/lib/minikube/certs/front-proxy-client.key
    - --requestheader-allowed-names=front-proxy-client
    - --requestheader-client-ca-file=/var/lib/minikube/certs/front-proxy-ca.crt
    - --requestheader-extra-headers-prefix=X-Remote-Extra-
    - --requestheader-group-headers=X-Remote-Group
    - --requestheader-username-headers=X-Remote-User
    - --secure-port=8443
    - --service-account-key-file=/var/lib/minikube/certs/sa.pub
    - --service-cluster-ip-range=10.10.0.0/24
    - --service-node-port-range=1024-65535
    - --tls-cert-file=/var/lib/minikube/certs/apiserver.crt
    - --tls-private-key-file=/var/lib/minikube/certs/apiserver.key
  image: registry.cn-hangzhou.aliyuncs.com/google_containers/kube-apiserver:v1.19.2
  imagePullPolicy: IfNotPresent
  livenessProbe:
    failureThreshold: 8
    httpGet:
      host: 192.168.64.5
      path: /livez
      port: 8443
      scheme: HTTPS
    initialDelaySeconds: 10
    periodSeconds: 10
    timeoutSeconds: 15
  name: kube-apiserver
  readinessProbe:
    failureThreshold: 3
    httpGet:
      host: 192.168.64.5
      path: /readyz
      port: 8443
      scheme: HTTPS
    periodSeconds: 1
    timeoutSeconds: 15
  resources:
    requests:
      cpu: 250m
  startupProbe:
    failureThreshold: 24
    httpGet:
      host: 192.168.64.5
      path: /livez
```

```

    port: 8443
    scheme: HTTPS
  initialDelaySeconds: 10
  periodSeconds: 10
  timeoutSeconds: 15
  volumeMounts:
    - mountPath: /etc/ssl/certs
      name: ca-certs
      readOnly: true
    - mountPath: /var/lib/minikube/certs
      name: k8s-certs
      readOnly: true
    - mountPath: /usr/share/ca-certificates
      name: usr-share-ca-certificates
      readOnly: true
  hostNetwork: true
  priorityClassName: system-node-critical
  volumes:
    - hostPath:
        path: /etc/ssl/certs
        type: DirectoryOrCreate
        name: ca-certs
    - hostPath:
        path: /var/lib/minikube/certs
        type: DirectoryOrCreate
        name: k8s-certs
    - hostPath:
        path: /usr/share/ca-certificates
        type: DirectoryOrCreate
        name: usr-share-ca-certificates
  status: {}

```

```
sudo systemctl restart kubelet
```

## 5.7. Exiting due to MK\_ENABLE: run callbacks: running callbacks: [verifying registry addon pods : timed out waiting for the condition: timed out waiting for the condition]

```
iMac:~ neo$ minikube addons enable registry
🔗 Verifying registry addon...

✖ Exiting due to MK_ENABLE: run callbacks: running callbacks: [verifying registry addon pods : timed out waiting for the condition: timed out waiting for the condition]

👉 If the above advice does not help, please let us know:
👉 https://github.com/kubernetes/minikube/issues/new/choose
```

**5.8. Exiting due to SVC\_URL\_TIMEOUT:**  
**http://127.0.0.1:11068/api/v1/namespaces/kubernetes-**  
**dashboard/services/http:kubernetes-dashboard:/proxy/ is not accessible:**  
**Temporary Error: unexpected response code: 503**

```
minikube dashboard --alsologtostderr -v=1
```

```
[docker@localhost ~]$ kubectl get pods --all-namespaces | grep dashboard
kubernetes-dashboard    dashboard-metrics-scraper-6f7955cd98-xjzkq    0/1
ImagePullBackOff        0           11d
kubernetes-dashboard    kubernetes-dashboard-7bf64fd654-ckr7v      0/1
ImagePullBackOff        0           11d
```

```
[docker@localhost ~]$ kubectl logs --namespace=kubernetes-dashboard kubernetes-
dashboard-7bf64fd654-ckr7v
Error from server (BadRequest): container "kubernetes-dashboard" in pod
"kubernetes-dashboard-7bf64fd654-ckr7v" is waiting to start: trying and failing
to pull image
```

## 5.9. Mac minikube ip 不通， ingress 不工作

```
minikube start --image-mirror-country=cn --insecure-
registry="registry.netkiller.cn" --cache-images=true
```

```
Neo-iMac:~ neo$ kubectl get pods -n ingress-nginx
NAME                               READY   STATUS    RESTARTS   AGE
ingress-nginx-admission-create--1-qpckk   0/1     Completed   0          18h
ingress-nginx-admission-patch--1-5x941   0/1     Completed   0          18h
ingress-nginx-controller-78d858bdc7-nrszs 1/1     Running    1          18h

Neo-iMac:~ neo$ kubectl create deployment web --image=nginx:latest
deployment.apps/web created
```

```

Neo-iMac:~ neo$ kubectl expose deployment web --type=NodePort --port=80
service/web exposed

Neo-iMac:~ neo$ kubectl get service web
NAME      TYPE      CLUSTER-IP      EXTERNAL-IP      PORT(S)      AGE
web       NodePort   10.109.55.204   <none>        8080:30857/TCP   19s

Neo-iMac:~ neo$ minikube service web --url
🏃 Starting tunnel for service web.

|-----|-----|-----|-----|
| NAMESPACE | NAME | TARGET PORT | URL |
|-----|-----|-----|-----|
| default   | web  |             | http://127.0.0.1:62956 |
|-----|-----|-----|-----|
http://127.0.0.1:62956
! Because you are using a Docker driver on darwin, the terminal needs to be
open to run it.

```

### ingress.yaml

```

apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: nginx
  annotations:
    kubernetes.io/ingress.class: nginx
spec:
  rules:
    - host: www.netkiller.cn
      http:
        paths:
          - path: /
            pathType: Prefix
            backend:
              service:
                name: web
                port:
                  number: 80

```

http://www.netkiller.cn 无法访问，解决方案 minikube tunnel

```

Neo-iMac:~ neo$ minikube tunnel
! The service/ingress example-ingress requires privileged ports to be exposed:
[80 443]
🔑 sudo permission will be asked for it.
🏃 Starting tunnel for service example-ingress.
Password:

```

如果注意观察，在启动的时候系统已经提示： After the addon is enabled, please run "minikube tunnel" and your ingress resources would be available at "127.0.0.1"

```
Neo-iMac:nginx neo$ minikube start --image-mirror-country=cn --insecure-registry="registry.netkiller.cn" --cache-images=true
😄  minikube v1.24.0 on Darwin 12.0.1
💡  Using the docker driver based on existing profile
👍  Starting control plane node minikube in cluster minikube
🚜  Pulling base image ...
🔄  Restarting existing docker container for "minikube" ...
🌐  Preparing Kubernetes v1.22.3 on Docker 20.10.8 ...
🔍  Verifying Kubernetes components...
💡  After the addon is enabled, please run "minikube tunnel" and your ingress resources would be available at "127.0.0.1"
    ■ Using image registry.cn-
hangzhou.aliyuncs.com/google_containers/dashboard:v2.3.1
    ■ Using image registry.cn-hangzhou.aliyuncs.com/google_containers/storage-provisioner:v5
        ■ Using image registry.cn-hangzhou.aliyuncs.com/google_containers/nginx-ingress-controller:v1.0.4
        ■ Using image registry.cn-hangzhou.aliyuncs.com/google_containers/metrics-scraper:v1.0.7
        ■ Using image registry.cn-hangzhou.aliyuncs.com/google_containers/kube-webhook-certgen:v1.1.1
        ■ Using image registry.cn-hangzhou.aliyuncs.com/google_containers/kube-webhook-certgen:v1.1.1
🔍  Verifying ingress addon...
💡  Enabled addons: dashboard, storage-provisioner, default-storageclass, ingress
🎉  Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
```

# 第 4 章 microk8s

<https://microk8s.io>

更多配置参考官网 <https://github.com/ubuntu/microk8s>

## 1. 安装 microk8s

latest/stable 安装最新版本

```
root@kubernetes:~# snap install microk8s --classic --channel=latest/stable
microk8s v1.21.3 from Canonical✓ installed
```

查看安装情况

```
root@kubernetes:~# snap list
Name      Version   Rev  Tracking      Publisher    Notes
core18    20210722 2128 latest/stable canonical✓  base
1xd       4.0.7     21029 4.0/stable/... canonical✓  -
microk8s  v1.21.3  2346 latest/stable canonical✓  classic
snapd     2.51.4    12883 latest/stable canonical✓  snapd
```

```
root@kubernetes:~# microk8s start
Started.
```

启用或禁用 microk8s

```
snap disable microk8s  # 禁用
snap enable microk8s   # 启用
```

## 卸載

```
microk8s.reset  
snap remove microk8s
```

## 安裝 VirtualBox

```
neo@ubuntu:~$ sudo apt install -y virtualbox
```

### 1.1. 安裝指定版本

```
root@kubernetes:~# snap info microk8s  
name:      microk8s  
summary:   Lightweight Kubernetes for workstations and appliances  
publisher: Canonical✓  
store-url: https://snapcraft.io/microk8s  
contact:   https://github.com/ubuntu/microk8s  
license:   unset  
description: |  
    MicroK8s is the smallest, simplest, pure production Kubernetes for  
clusters, laptops, IoT and  
    Edge, on Intel and ARM. One command installs a single-node K8s cluster  
with carefully selected  
    add-ons on Linux, Windows and macOS. MicroK8s requires no  
configuration, supports automatic  
    updates and GPU acceleration. Use it for offline development,  
prototyping, testing, to build your  
    CI/CD pipeline or your IoT apps.  
commands:  
  - microk8s.add-node  
  - microk8s.cilium  
  - microk8s.config  
  - microk8s.ctr  
  - microk8s.dashboard-proxy  
  - microk8s.dbctl  
  - microk8s.disable  
  - microk8s.enable  
  - microk8s.helm  
  - microk8s.helm3
```

```
- microk8s.inspect
- microk8s.istioctl
- microk8s.join
- microk8s.juju
- microk8s.kubectl
- microk8s.leave
- microk8s.linkerd
- microk8s
- microk8s.refresh-certs
- microk8s.remove-node
- microk8s.reset
- microk8s.start
- microk8s.status
- microk8s.stop
services:
  microk8s.daemon-apiserver:           simple, enabled, inactive
  microk8s.daemon-apiserver-kicker:    simple, enabled, active
  microk8s.daemon-cluster-agent:       simple, enabled, active
  microk8s.daemon-containerd:         simple, enabled, active
  microk8s.daemon-control-plane-kicker: simple, enabled, inactive
  microk8s.daemon-controller-manager:  simple, enabled, inactive
  microk8s.daemon-etcd:               simple, enabled, inactive
  microk8s.daemon-flanneld:          simple, enabled, inactive
  microk8s.daemon-kubelet:            simple, enabled, inactive
  microk8s.daemon-kubelite:           simple, enabled, active
  microk8s.daemon-proxy:              simple, enabled, inactive
  microk8s.daemon-scheduler:          simple, enabled, inactive
snap-id:      EaXqgtllyCaxKaQCU349mlodBkDCXRcg
tracking:     latest/stable
refresh-date: today at 07:54 UTC
channels:
  1.21/stable:      v1.21.3  2021-07-27 (2346) 191MB classic
  1.21/candidate:   v1.21.4  2021-08-20 (2407) 191MB classic
  1.21/beta:        v1.21.4  2021-08-20 (2407) 191MB classic
  1.21/edge:         v1.21.4  2021-08-23 (2427) 191MB classic
  latest/stable:    v1.21.3  2021-07-28 (2346) 191MB classic
  latest/candidate: v1.22.1  2021-08-20 (2424) 195MB classic
  latest/beta:       v1.22.1  2021-08-20 (2424) 195MB classic
  latest/edge:        v1.22.1  2021-08-27 (2451) 195MB classic
  dqldite/stable:   -
  dqldite/candidate: -
  dqldite/beta:     -
  dqldite/edge:      v1.16.2  2019-11-07 (1038) 189MB classic
  1.22/stable:      v1.22.0  2021-08-13 (2399) 195MB classic
  1.22/candidate:   v1.22.1  2021-08-27 (2450) 195MB classic
  1.22/beta:         v1.22.1  2021-08-27 (2450) 195MB classic
  1.22/edge:         v1.22.1  2021-08-27 (2450) 195MB classic
  1.20/stable:      v1.20.9  2021-08-01 (2361) 221MB classic
  1.20/candidate:   v1.20.10 2021-08-19 (2409) 221MB classic
  1.20/beta:         v1.20.10 2021-08-19 (2409) 221MB classic
  1.20/edge:         v1.20.10 2021-08-12 (2409) 221MB classic
```

```
1.19/stable:      v1.19.13 2021-07-26 (2339) 216MB classic
1.19/candidate:  v1.19.14 2021-08-19 (2408) 216MB classic
1.19/beta:        v1.19.14 2021-08-19 (2408) 216MB classic
1.19/edge:        v1.19.14 2021-08-12 (2408) 216MB classic
1.18/stable:      v1.18.20 2021-07-12 (2271) 198MB classic
1.18/candidate:  v1.18.20 2021-07-12 (2271) 198MB classic
1.18/beta:        v1.18.20 2021-07-12 (2271) 198MB classic
1.18/edge:        v1.18.20 2021-06-16 (2271) 198MB classic
1.17/stable:      v1.17.17 2021-01-15 (1916) 177MB classic
1.17/candidate:  v1.17.17 2021-01-14 (1916) 177MB classic
1.17/beta:        v1.17.17 2021-01-14 (1916) 177MB classic
1.17/edge:        v1.17.17 2021-01-13 (1916) 177MB classic
1.16/stable:      v1.16.15 2020-09-12 (1671) 179MB classic
1.16/candidate:  v1.16.15 2020-09-04 (1671) 179MB classic
1.16/beta:        v1.16.15 2020-09-04 (1671) 179MB classic
1.16/edge:        v1.16.15 2020-09-02 (1671) 179MB classic
1.15/stable:      v1.15.11 2020-03-27 (1301) 171MB classic
1.15/candidate:  v1.15.11 2020-03-27 (1301) 171MB classic
1.15/beta:        v1.15.11 2020-03-27 (1301) 171MB classic
1.15/edge:        v1.15.11 2020-03-26 (1301) 171MB classic
1.14/stable:      v1.14.10 2020-01-06 (1120) 217MB classic
1.14/candidate:  ↑
1.14/beta:        ↑
1.14/edge:        v1.14.10 2020-03-26 (1303) 217MB classic
1.13/stable:      v1.13.6  2019-06-06 (581) 237MB classic
1.13/candidate:  ↑
1.13/beta:        ↑
1.13/edge:        ↑
1.12/stable:      v1.12.9  2019-06-06 (612) 259MB classic
1.12/candidate:  ↑
1.12/beta:        ↑
1.12/edge:        ↑
1.11/stable:      v1.11.10 2019-05-10 (557) 258MB classic
1.11/candidate:  ↑
1.11/beta:        ↑
1.11/edge:        ↑
1.10/stable:      v1.10.13 2019-04-22 (546) 222MB classic
1.10/candidate:  ↑
1.10/beta:        ↑
1.10/edge:        ↑
installed:        v1.21.3          (2346) 191MB classic
```

```
snap install microk8s --channel=1.14/beta --classic
```

## 2. 组件管理

```
root@kubernetes:~# microk8s enable ADDON -- --help
Addon ADDON does not yet have a help message.
For more information about it, visit https://microk8s.io/docs/addons
```

### 启用组件

```
microk8s enable dashboard dns ingress istio registry storage
```

microk8s 只是最精简的安装，所以只有 api-server, controller-manager, scheduler, kubelet, cni, kube-proxy 被安装运行。额外的服务比如 kube-dns, dashboard 可以通过 microk8s.enable 启动

### 可用的扩展

```
dns
dashboard
storage
ingress
gpu
istio
registry
metrics-server
```

#### 2.1. dns

```
microk8s.enable dns
禁用
microk8s.disable dns
```

## 2.2. dashboard

```
microk8s enable dashboard
```

```
root@kubernetes:~# microk8s enable dashboard
Enabling Kubernetes Dashboard
Addon metrics-server is already enabled.
Applying manifest
serviceaccount/kubernetes-dashboard created
service/kubernetes-dashboard created
secret/kubernetes-dashboard-certs created
secret/kubernetes-dashboard-csrf created
secret/kubernetes-dashboard-key-holder created
configmap/kubernetes-dashboard-settings created
role.rbac.authorization.k8s.io/kubernetes-dashboard created
clusterrole.rbac.authorization.k8s.io/kubernetes-dashboard created
rolebinding.rbac.authorization.k8s.io/kubernetes-dashboard created
clusterrolebinding.rbac.authorization.k8s.io/kubernetes-dashboard
created
deployment.apps/kubernetes-dashboard created
service/dashboard-metrics-scraper created
deployment.apps/dashboard-metrics-scraper created
```

If RBAC is not enabled access the dashboard using the default token retrieved with:

```
token=$(microk8s kubectl -n kube-system get secret | grep default-token
| cut -d " " -f1)
microk8s kubectl -n kube-system describe secret $token
```

In an RBAC enabled setup (microk8s enable RBAC) you need to create a user with restricted permissions as shown in:  
<https://github.com/kubernetes/dashboard/blob/master/docs/user/access-control/creating-sample-user.md>

```
microk8s dashboard-proxy
```

### 3. kubectl

为了不和已经安装的 kubectl 产生冲突，microk8s 有自己的 microk8s.kubectl 命令

```
microk8s.kubectl get services
```

如果本地没有 kubectl 命令可以增加一个别名

```
sudo snap alias microk8s.kubectl kubectl
```

取消别名

```
sudo snap unalias kubectl
```

API 服务监听 8080 端口

```
microk8s.kubectl config view
```

## 4. Kubernetes Addons

### 4.1.

```
root@kubernetes:~# microk8s kubectl get all --all-namespaces
NAMESPACE      NAME
READY   STATUS    RESTARTS   AGE
kube-system   pod/calico-kube-controllers-f7868dd95-xrt2w
0/1     Pending   0          83m
kube-system   pod/metrics-server-8bbfb4bdb-6m92q
0/1     Pending   0          74m
kube-system   pod/calico-node-vpsbv
0/1     Init:0/3  0          83m
kube-system   pod/kubernetes-dashboard-85fd7f45cb-w824z
0/1     Pending   0          114s
kube-system   pod/dashboard-metrics-scraper-78d7698477-g5b5k
0/1     Pending   0          114s

NAMESPACE      NAME                      TYPE
CLUSTER-IP      EXTERNAL-IP    PORT(S)    AGE
default         service/kubernetes        ClusterIP
10.152.183.1   <none>           443/TCP    83m
kube-system     service/metrics-server    ClusterIP
10.152.183.99  <none>           443/TCP    74m
kube-system     service/kubernetes-dashboard ClusterIP
10.152.183.225 <none>           443/TCP    114s
kube-system     service/dashboard-metrics-scraper ClusterIP
10.152.183.11  <none>           8000/TCP   114s

NAMESPACE      NAME          DESIRED   CURRENT   AGE
READY   UP-TO-DATE  AVAILABLE  NODE SELECTOR
kube-system   daemonset.apps/calico-node  1          1          0
1           0           kubernetes.io/os=linux  83m

NAMESPACE      NAME          READY
UP-TO-DATE  AVAILABLE  AGE
kube-system   deployment.apps/calico-kube-controllers  0/1
1           0           83m
kube-system   deployment.apps/metrics-server    0/1
1           0           74m
kube-system   deployment.apps/kubernetes-dashboard 0/1
```

```
1          0      114s
kube-system  deployment.apps/dashboard-metrics-scraper   0/1
1          0      114s

NAMESPACE      NAME
DESIRED      CURRENT      READY      AGE
kube-system  replicaset.apps/calico-kube-controllers-f7868dd95
1            1            0          83m
kube-system  replicaset.apps/metrics-server-8bbfb4bdb
1            1            0          74m
kube-system  replicaset.apps/kubernetes-dashboard-85fd7f45cb
1            1            0          114s
kube-system  replicaset.apps/dashboard-metrics-scraper-
78d7698477    1            1            0          114s
```

# 第 5 章 Kubernetes 集群管理

***kubectl - controls the Kubernetes cluster manager.***

kubectl是Kubernetes的命令行管理工具

```
kubectl controls the Kubernetes cluster manager.

Find more information at:
https://kubernetes.io/docs/reference/kubectl/overview/

Basic Commands (Beginner):
  create      Create a resource from a file or from stdin.
  expose      Take a replication controller, service,
deployment or pod and expose it as a new Kubernetes Service
  run         Run a particular image on the cluster
  set         Set specific features on objects

Basic Commands (Intermediate):
  explain     Documentation of resources
  get         Display one or many resources
  edit        Edit a resource on the server
  delete      Delete resources by filenames, stdin,
resources and names, or by resources and label selector

Deploy Commands:
  rollout     Manage the rollout of a resource
  scale       Set a new size for a Deployment, ReplicaSet,
Replication Controller, or Job
  autoscale   Auto-scale a Deployment, ReplicaSet, or
ReplicationController

Cluster Management Commands:
  certificate Modify certificate resources.
  cluster-info Display cluster info
  top          Display Resource (CPU/Memory/Storage) usage.
  cordon      Mark node as unschedulable
  uncordon    Mark node as schedulable
  drain       Drain node in preparation for maintenance
  taint       Update the taints on one or more nodes
```

**Troubleshooting and Debugging Commands:**

describe	Show details of a specific resource or group of resources
logs	Print the logs for a container in a pod
attach	Attach to a running container
exec	Execute a command in a container
port-forward	Forward one or more local ports to a pod
proxy	Run a proxy to the Kubernetes API server
cp	Copy files and directories to and from containers.
auth	Inspect authorization

**Advanced Commands:**

diff	Diff live version against would-be applied version
apply	Apply a configuration to a resource by filename or stdin
patch	Update field(s) of a resource using strategic merge patch
replace	Replace a resource by filename or stdin
wait	Experimental: Wait for a specific condition on one or many resources.
convert	Convert config files between different API versions

**Settings Commands:**

label	Update the labels on a resource
annotate	Update the annotations on a resource
completion	Output shell completion code for the specified shell (bash or zsh)

**Other Commands:**

api-resources	Print the supported API resources on the server
api-versions	Print the supported API versions on the server, in the form of "group/version"
config	Modify kubeconfig files
plugin	Provides utilities for interacting with plugins.
version	Print the client and server version information

**Usage:**

```
kubectl [flags] [options]
```

```
Use "kubectl <command> --help" for more information about a
given command.
Use "kubectl options" for a list of global command-line options
(applies to all commands).
```

# 1. 配置

## 1.1. KUBECONFIG

KUBECONFIG 环境变量

## 1.2. use-context

```
[root@netkiller ~]# kubectl config view
apiVersion: v1
clusters:
- cluster:
    certificate-authority-data: DATA+OMITTED
    server: https://127.0.0.1:6445
    name: k3d-mycluster
contexts:
- context:
    cluster: k3d-mycluster
    user: admin@k3d-mycluster
    name: k3d-mycluster
current-context: k3d-mycluster
kind: Config
preferences: {}
users:
- name: admin@k3d-mycluster
  user:
    client-certificate-data: REDACTED
    client-key-data: REDACTED
```

```
$ kubectl config use-context
```

## 2. 如何从 docker 过渡到 kubectl 命令

docker run 命令

```
$ docker run -d --restart=always -e DOMAIN=cluster --name nginx  
-p 80:80 nginx
```

kubectl 命令

```
$ kubectl run --image=nginx nginx-app --port=80 --  
env="DOMAIN=cluster"  
$ kubectl expose deployment nginx-app --port=80 --name=nginx-  
http
```

docker exec 命令

```
$ docker run -t -i ubuntu:14.10 /bin/bash
```

kubectl 命令

```
$ kubectl exec -ti nginx-app-5jyvm -- /bin/sh
```

docker ps 命令

```
$ docker ps
```

## kubectl 命令

```
$ kubectl get pods
NAME                  READY   STATUS    RESTARTS   AGE
mongodba-6d5d6ddf64-jw4fv   1/1     Running   0          16h

# kubectl exec -it mongodba-6d5d6ddf64-jw4fv bash
```

### 3. 查看信息

#### 3.1. api-versions

```
iMac:springboot neo$ kubectl api-versions
admissionregistration.k8s.io/v1
admissionregistration.k8s.io/v1beta1
apiextensions.k8s.io/v1
apiextensions.k8s.io/v1beta1
apiregistration.k8s.io/v1
apiregistration.k8s.io/v1beta1
apps/v1
authentication.k8s.io/v1
authentication.k8s.io/v1beta1
authorization.k8s.io/v1
authorization.k8s.io/v1beta1
autoscaling/v1
autoscaling/v2beta1
autoscaling/v2beta2
batch/v1
batch/v1beta1
certificates.k8s.io/v1
certificates.k8s.io/v1beta1
coordination.k8s.io/v1
coordination.k8s.io/v1beta1
discovery.k8s.io/v1beta1
events.k8s.io/v1
events.k8s.io/v1beta1
extensions/v1beta1
networking.k8s.io/v1
networking.k8s.io/v1beta1
node.k8s.io/v1beta1
policy/v1beta1
rbac.authorization.k8s.io/v1
rbac.authorization.k8s.io/v1beta1
scheduling.k8s.io/v1
scheduling.k8s.io/v1beta1
storage.k8s.io/v1
storage.k8s.io/v1beta1
v1
```

## 3.2. 节点

```
[root@localhost ~]# kubectl get nodes
NAME      STATUS    ROLES    AGE     VERSION
minikube  Ready     master   23m    v1.13.2
```

### nodes

```
[root@localhost ~]# kubectl get nodes
NAME      STATUS    ROLES    AGE     VERSION
minikube  Ready     master   119m   v1.13.2
```

```
iMac:~ neo$ kubectl get node
NAME      STATUS    ROLES    AGE     VERSION
minikube  Ready     master   42h    v1.19.0

iMac:~ neo$ kubectl get node -o wide
NAME      STATUS    ROLES    AGE     VERSION    INTERNAL-IP
EXTERNAL-IP  OS-IMAGE          KERNEL-VERSION    CONTAINER-
RUNTIME
minikube  Ready     master   42h    v1.19.0    192.168.64.2
<none>       Buildroot 2019.02.11  4.19.114
docker://19.3.12
```

## 3.3. 查询集群状态

```
[root@localhost ~]# kubectl get cs
NAME                  STATUS    MESSAGE           ERROR
controller-manager   Healthy   ok
scheduler            Healthy   ok
etcd-0               Healthy   {"health": "true"}
```

### 3.4. config

```
[root@localhost ~]# kubectl config view
apiVersion: v1
clusters:
- cluster:
    certificate-authority: /root/.minikube/ca.crt
    server: https://172.16.0.121:8443
    name: minikube
contexts:
- context:
    cluster: minikube
    user: minikube
    name: minikube
current-context: minikube
kind: Config
preferences: {}
users:
- name: minikube
  user:
    client-certificate: /root/.minikube/client.crt
    client-key: /root/.minikube/client.key
```

```
iMac:~ neo$ kubectl config view
apiVersion: v1
clusters:
- cluster:
    certificate-authority-data: DATA+OMITTED
    server: https://kubernetes.docker.internal:6443
    name: docker-desktop
- cluster:
```

```
certificate-authority: /Users/neo/.minikube/ca.crt
server: https://192.168.64.2:8443
name: minikube
contexts:
- context:
    cluster: docker-desktop
    user: docker-desktop
    name: docker-desktop
- context:
    cluster: minikube
    user: minikube
    name: minikube
current-context: minikube
kind: Config
preferences: {}
users:
- name: docker-desktop
  user:
    client-certificate-data: REDACTED
    client-key-data: REDACTED
- name: minikube
  user:
    client-certificate:
    /Users/neo/.minikube/profiles/minikube/client.crt
    client-key:
    /Users/neo/.minikube/profiles/minikube/client.key
```

## use-context

如果之前用其他方式运行Kubernetes，如 minikube, mircok8s 等等，可以使用下面命令切换。

```
$ kubectl config use-context docker-for-desktop
```

## 3.5. cluster-info

```
[root@localhost ~]# kubectl cluster-info
Kubernetes master is running at https://172.16.0.121:8443
KubeDNS is running at
https://172.16.0.121:8443/api/v1/namespaces/kube-
system/services/kube-dns:dns/proxy

To further debug and diagnose cluster problems, use 'kubectl
cluster-info dump'.
```

## 4. namespace 命名空间

### 4.1. 查看命名空间

```
root@netkiller ~# kubectl get ns
NAME        STATUS   AGE
default     Active   197d
kube-system Active   197d
kube-public Active   197d
kube-node-lease Active   197d
longhorn-system Active   195d
test        Active   163d
gitlab      Active   156d
dev         Active   155d
training    Active   133d
project     Active   24h

root@netkiller ~# kubectl get namespace
NAME        STATUS   AGE
default     Active   197d
kube-system Active   197d
kube-public Active   197d
kube-node-lease Active   197d
longhorn-system Active   195d
test        Active   163d
gitlab      Active   156d
dev         Active   155d
training    Active   133d
project     Active   24h
```

### 4.2. 创建命名空间

```
$ kubectl create namespace new-namespace
```

## 4.3. 使用 yaml 创建命名空间

创建 jenkins-namespace.yaml

```
apiVersion: v1
kind: Namespace
metadata:
  name: jenkins-project
```

```
$ kubectl create -f jenkins-namespace.yaml
namespace "jenkins-project" created
```

## 4.4. 删除命名空间

```
root@netkiller ~# kubectl delete namespace new-namespace
namespace "new-namespace" deleted
```

## 5. label 标签

label 用于识别对象，管理关联关系等目的，如Pod、Service、Deployment、Node的关联。

```
kubectl label nodes <node-name> <label-key>=<label-value>
```

打标签，例如 disk-type=ssd

```
[root@master ~]# kubectl label nodes agent-1 disk-type:ssd  
node/agent-1 labeled
```

查看标签

```
[root@master ~]# kubectl get node --show-labels  
NAME      STATUS  ROLES   AGE    VERSION  LABELS  
master    Ready   master   42d    v1.17.4  
beta.kubernetes.io/arch=amd64,beta.kubernetes.io/os=linux,kubernetes.io/  
arch=amd64,kubernetes.io/hostname=master,kubernetes.io/os=linux,node-  
role.kubernetes.io/master=  
agent-1   Ready   <none>   42d    v1.17.4  
beta.kubernetes.io/arch=amd64,beta.kubernetes.io/os=linux,disk-  
type:ssd,kubernetes.io/arch=amd64,kubernetes.io/hostname=agent-  
1,kubernetes.io/os=linux  
agent-2   Ready   <none>   42d    v1.17.4  
beta.kubernetes.io/arch=amd64,beta.kubernetes.io/os=linux,kubernetes.io/  
arch=amd64,kubernetes.io/hostname=agent-2,kubernetes.io/os=linux
```

删除标签

```
[root@master ~]# kubectl label nodes agent-1 disk-type-  
node/agent-1 unlabeled
```



## 6. 服务管理

### 6.1. 列出服务

```
[root@localhost ~]# kubectl get service
NAME           TYPE      CLUSTER-IP   EXTERNAL-IP   PORT(S)      AGE
hello-minikube  NodePort  10.109.33.86 <none>        8080:30436/TCP 134m
kubernetes     ClusterIP 10.96.0.1    <none>        443/TCP      147m
```

排序

```
iMac:kubernetes neo$ kubectl get services --sort-by=.metadata.name
NAME           TYPE      CLUSTER-IP   EXTERNAL-IP   PORT(S)      AGE
kubernetes     ClusterIP 10.96.0.1    <none>        443/TCP      121m
my-service     ClusterIP 10.106.157.143 <none>        80/TCP,443/TCP 9m43s
```

### 6.2. 创建服务

创建 service.yaml 文件

```
apiVersion: v1
kind: Service
metadata:
  name: my-service
spec:
  selector:
    app: MyApp
  ports:
  - name: http
    protocol: TCP
    port: 80
    targetPort: 80
  - name: https
    protocol: TCP
    port: 443
    targetPort: 443
```

```
iMac:kubernetes neo$ kubectl create -f service.yaml
```

```
service/my-service created
```

## 查看服务

```
iMac:kubernetes neo$ kubectl get service
NAME      TYPE      CLUSTER-IP      EXTERNAL-IP      PORT(S)      AGE
kubernetes  ClusterIP  10.96.0.1    <none>        443/TCP      113m
my-service  ClusterIP  10.106.157.143  <none>        80/TCP,443/TCP  64s
```

查看 service 后端代理的 pod 的 ip，这里没有挂载 pod 所以显示 none

```
iMac:kubernetes neo$ kubectl get endpoints my-service
NAME      ENDPOINTS      AGE
my-service  <none>      2m20s
```

## 6.3. 查看服务详细信息

```
iMac:kubernetes neo$ kubectl describe service/registry
Name:           registry
Namespace:      default
Labels:          app=registry
Annotations:    <none>
Selector:        app=registry
Type:           NodePort
IP:             10.10.0.188
Port:           registry  5000/TCP
TargetPort:     5000/TCP
NodePort:        registry  32050/TCP
Endpoints:      172.17.0.6:5000
Session Affinity: None
External Traffic Policy: Cluster
Events:
```

## 查看服务

```
> kubectl get service
NAME      TYPE      CLUSTER-IP      EXTERNAL-IP
PORT(S)      AGE
```

	kubernetes	ClusterIP	10.43.0.1	<none>	
443/TCP	nacos	ClusterIP	10.43.175.40	<none>	
8848/TCP,9848/TCP,9555/TCP	redis	NodePort	10.43.129.224	<none>	
6379:31436/TCP	kube-explorer	ClusterIP	10.43.208.84	<none>	80/TCP
36h	elasticsearch	ClusterIP	10.43.241.136	<none>	
9200/TCP,9300/TCP	elasticsearch-data	ClusterIP	10.43.39.228	<none>	
9300/TCP	kibana	ClusterIP	10.43.193.15	<none>	80/TCP
13h	mysql	ExternalName	<none>	master	
3306/TCP	mongo	ExternalName	<none>	master	
27017/TCP		6m24s			
 > kubectl get service -o wide					
NAME                        TYPE        CLUSTER-IP               EXTERNAL-IP					
PORT(S)	kubernetes	TYPE	CLUSTER-IP	EXTERNAL-IP	
	443/TCP	ClusterIP	10.43.0.1	<none>	
4d13h <none>					
nacos					
8848/TCP,9848/TCP,9555/TCP					
4d13h app=nacos					
redis					
6379:31436/TCP					
42h app=redis					
kube-explorer					
36h app=kube-explorer					
elasticsearch					
9200/TCP,9300/TCP					
13h app=elasticsearch,role=master					
elasticsearch-data					
9300/TCP					
13h app=elasticsearch,role=data					
kibana					
13h app=kibana					
mysql					
3306/TCP					
6m45s <none>					
mongo					
27017/TCP					
6m45s <none>					

## 6.4. 更新服务

```
kubectl replace -f service.yaml --force
```

## 6.5. 删除服务

```
kubectl delete service hello-minikube
```

## 6.6. clusterip

语法

```
$ kubectl create service clusterip NAME [--tcp=<port>:<targetPort>] [--dry-run]
```

演示

```
kubectl create service clusterip my-service --tcp=5678:8080
```

headless 模式

```
kubectl create service clusterip my-service --clusterip="None"
```

selector

```
apiVersion: v1
kind: Service
metadata:
  name: spring-cloud-config-server
  namespace: default
  labels:
    app: springboot
spec:
  ports: web
  - port: 8888
    targetPort: web
  clusterIP: 10.10.0.1
  selector:
    app: spring-cloud-config-server
```

## 6.7. 设置外部IP

报漏 80.11.12.10:80 地址

```
apiVersion: v1
kind: Service
metadata:
  name: my-service
spec:
  selector:
    app: MyApp
  ports:
    - name: http
      protocol: TCP
      port: 80
      targetPort: 9376
  externalIPs:
    - 80.11.12.10
```

## 6.8. externalname

语法

```
$ kubectl create service externalname NAME --external-name external.name [--dry-run]
```

演示

```
kubectl create service externalname my-externalname --external-name bar.com
```

绑定外部域名

```
apiVersion: v1
kind: Service
metadata:
  name: my-service
  namespace: prod
spec:
  type: ExternalName
  externalName: my.database.example.com
```

应用案例，在master节点宿主主机上安装了mysql和mongo地址，pod链接他们可以使宿主IP链接，或者写 master 主机名。

我认为更好的方法使用使用 Service 做一层映射，然后使用统一容器域名访问 mysql.default.svc.cluster.local, mongo.default.svc.cluster.local

```
metadata:
  name: mysql
  namespace: default
spec:
  ports:
    - name: mysql
      protocol: TCP
      port: 3306
      targetPort: 3306
  type: ExternalName
  externalName: master
apiVersion: v1
kind: Service
---
metadata:
  name: mongo
  namespace: default
spec:
  ports:
    - name: mongo
      protocol: TCP
      port: 27017
      targetPort: 27017
  type: ExternalName
  externalName: master
apiVersion: v1
kind: Service
```

## 6.9. loadbalancer

语法

```
$ kubectl create service loadbalancer NAME [--tcp=port:targetPort] [--dry-run]
```

演示

```
kubectl create service loadbalancer my-lb --tcp=5678:8080
```

## LoadBalancer YAML

一般 HTTP 服务通过 ingress 对外报漏服务，TCP 的 Socket 服务可以使用 LoadBalancer 进行报漏

```
apiVersion: v1
kind: Service
metadata:
  name: my-service
spec:
  selector:
    app: MyApp
  ports:
    - protocol: TCP
      port: 80
      targetPort: 9376
  clusterIP: 10.0.171.239
  type: LoadBalancer
status:
  loadBalancer:
    ingress:
      - ip: 192.0.2.127
```

```
apiVersion: v1
kind: Service
metadata:
  name: example-service
spec:
  selector:
    app: example
  ports:
    - port: 8765
      targetPort: 9376
  type: LoadBalancer
```

## 6.10. nodeport

语法

```
$ kubectl create service nodeport NAME [--tcp=port:targetPort] [--dry-run]
```

演示

```
kubectl create service nodeport my-nodeport --tcp=5678:8080
```

## NodePort YAML

```
apiVersion: v1
kind: Service
metadata:
  name: my-service
spec:
  type: NodePort
  selector:
    app: MyApp
  ports:
    # By default and for convenience, the `targetPort` is set to
    # the same value as the `port` field.
    - port: 80
      targetPort: 80
      # Optional field
      # By default and for convenience, the Kubernetes control plane
      # will allocate a port from a range (default: 30000-32767)
      nodePort: 30007
```

## 6.11. Example

```
apiVersion: v1
kind: Service
metadata:
  name: registry
  namespace: default
  labels:
    app: registry
spec:
  type: NodePort
  selector:
    app: registry
  ports:
```

```
- name: registry
  port: 5000
  nodePort: 30050
  protocol: TCP
---
apiVersion: apps/v1
kind: Deployment
metadata:
  name: registry
  namespace: default
  labels:
    app: registry
spec:
  replicas: 1
  selector:
    matchLabels:
      app: registry
  template:
    metadata:
      labels:
        app: registry
    spec:
      containers:
        - name: registry
          image: registry:latest
          resources:
            limits:
              cpu: 100m
              memory: 100Mi
          env:
            - name: REGISTRY_HTTP_ADDR
              value: :5000
            - name: REGISTRY_STORAGE_FILESYSTEM_ROOTDIRECTORY
              value: /var/lib/registry
          ports:
            - containerPort: 5000
              name: registry
              protocol: TCP
```

## 7. serviceaccount

语法

```
$ kubectl create serviceaccount NAME [--dry-run]
```

演示

```
kubectl create serviceaccount my-service-account
```

```
apiVersion: v1
kind: ServiceAccount
metadata:
  labels:
    app: elasticsearch
  name: elasticsearch
  namespace: elastic
```

## 8. 部署管理

```
kubectl create -f https://raw.githubusercontent.com/kubernetes/dashboard/master/src/deploy/recommended/kubernetes-dashboard.yaml  
kubectl get pods --namespace=kube-system
```

### 8.1. Pod 管理

Pod 状态说明

Pod 状态：

- Pending: Pod已经被创建，但还没有完成调度，或者说有一个或多个镜像正处于从远程仓库下载的过程。处在这个阶段的Pod可能正在写数据到etcd中、调度、pull镜像或启动容器。
- Pending: Pod已经被创建，但还没有完成调度，或者说有一个或多个镜像正处于从远程仓库下载的过程。处在这个阶段的Pod可能正在写数据到etcd中、调度、pull镜像或启动容器。
- Running: 该Pod已经绑定到了一个节点上，Pod中所有的容器都已被创建。至少有一个容器正在运行，或者正处于启动或重启状态。
- Succeeded: Pod中的所有的容器已经正常的执行后退出，并且不会自动重启，一般会是在部署job的时候会出现。
- Failed: Pod中的所有容器都已终止了，并且至少有一个容器是因为失败终止。也就是说，容器以非0状态退出或者被系统终止。
- Unknown: APIServer无法正常获取到Pod对象的状态信息，通常是由于其无法与所在工作节点的kubelet通信所致。

Pod 错误的详细的说明

状态	描述
CrashLoopBackOff	容器退出， kubelet正在将它重启
InvalidImageName	无法解析镜像名称
ImageInspectError	无法校验镜像
ErrImageNeverPull	策略禁止拉取镜像
ImagePullBackOff	正在重试拉取
RegistryUnavailable	连接不到镜像中心
ErrImagePull	通用的拉取镜像出错
CreateContainerConfigError	不能创建kubelet使用的容器配置
CreateContainerError	创建容器失败
m.internallifecycle.PreStartContainer	执行hook报错
RunContainerError	启动容器失败
PostStartHookError	执行hook报错
ContainersNotInitialized	容器没有初始化完毕
ContainersNotReady	容器没有准备完毕
ContainerCreating	容器创建中
PodInitializing pod	初始化中
DockerDaemonNotReady	docker还没有完全启动
NetworkPluginNotReady	网络插件还没有完全启动

## 查看 POD 状态

```
kubectl get pod <pod-name> -o wide  
kubectl get pods --all-namespaces
```

查看默认命名空间下的 pod

```
[root@localhost ~]# kubectl get pod  
NAME                      READY   STATUS    RESTARTS   AGE  
hello-minikube-5c856cbf98-6vfpv   1/1     Running   0          6m59s
```

查看所有命名空间下的 Pod

```
[root@localhost ~]# kubectl get pods --all-namespaces  
NAMESPACE      NAME                      READY   STATUS    RESTARTS   AGE  
default        hello-minikube-5c856cbf98-6vfpv   1/1     Running   1          4d18h  
kube-system    coredns-86c58d9df4-2rfqf       1/1     Running   51         4d18h  
kube-system    coredns-86c58d9df4-wkb7l       1/1     Running   49         4d18h  
kube-system    etcd-minikube                 1/1     Running   12         4d18h  
kube-system    kube-addon-manager-minikube   1/1     Running   11         4d18h  
kube-system    kube-apiserver-minikube      1/1     Running   74         4d18h  
kube-system    kube-controller-manager-minikube 1/1     Running   31         4d18h  
kube-system    kube-proxy-brrdd             1/1     Running   1          4d18h  
kube-system    kube-scheduler-minikube      1/1     Running   31         4d18h  
kube-system    kubernetes-dashboard-ccc79bfc9-dxcq2 1/1     Running   7          4d17h  
kube-system    storage-provisioner          1/1     Running   2          4d18h
```

```
iMac:~ neo$ kubectl get pods --output=wide  
NAME                  READY   STATUS    RESTARTS   AGE   IP  
NODE      NOMINATED NODE   READINESS GATES  
registry-65854b565b-bkhvq   0/1     ImagePullBackOff   0     18m   172.17.0.4  
minikube   <none>           <none>
```

查看pod标签

```
kubectl get pods --show-labels
```

查看指定标签的pod

```
kubectl get pods -l run=nginx
```

## 指定命名空间

```
[root@localhost ~]# kubectl get pod --namespace=kube-system
NAME                      READY   STATUS    RESTARTS   AGE
coredns-86c58d9df4-2rfqf   1/1     Running   0          40m
coredns-86c58d9df4-wkb7l   1/1     Running   0          40m
etcd-minikube              1/1     Running   0          40m
kube-addon-manager-minikube 1/1     Running   0          41m
kube-apiserver-minikube    1/1     Running   2          40m
kube-controller-manager-minikube 1/1     Running   6          40m
kube-proxy-brrdd            1/1     Running   0          40m
kube-scheduler-minikube    1/1     Running   5          41m
kubernetes-dashboard-ccc79bfc9-dxcq2 1/1     Running   5          16m
storage-provisioner         1/1     Running   0          39m
```

## 格式化输出

```
neo@Netkiller-iMac ~> kubectl get pods -l app=nacos -o
jsonpath='{{.items[0].metadata.name}}'
nacos-0
```

## 查看 pod 下面容器

```
root@logging ~# kubectl --kubeconfig=/home/prod/.kube/config -n netkiller get pod neo-6787cfcb9-8s8pp -o jsonpath=".spec.containers[*].name"
filebeat neo
```

## 运行 POD

```
iMac:kubernetes neo$ kubectl run registry --image=registry:latest
```

```
kubectl run busybox --image=busybox --command -- ping www.netkiller.cn
```

```
kubectl run nginx --replicas=3 --labels="app@example" --image=nginx:latest --port=80
```

```
kubectl run busybox --rm=true --image=busybox --restart=Never -it
```

## 删除 pod

```
kubectl delete -n default pod registry  
kubectl delete -n default pod counter
```

## 查看 Pod 的事件

```
kubectl describe pod <pod-name>
```

```
iMac:~ neo$ kubectl describe pod springboot  
Name:           springboot  
Namespace:      default  
Priority:      0  
Node:          minikube/192.168.64.2  
Start Time:    Mon, 21 Sep 2020 16:17:03 +0800  
Labels:         run=springboot  
Annotations:   <none>  
Status:        Pending  
IP:  
IPs:          <none>  
Containers:  
  springboot:  
    Container ID:          127.0.0.1:5000/netkiller/config:latest  
    Image:                 127.0.0.1:5000/netkiller/config:latest  
    Image ID:              127.0.0.1:5000/netkiller/config@sha256:...  
    Port:                  8888/TCP  
    Host Port:             0/TCP  
    State:                Waiting  
      Reason:              ContainerCreating  
    Ready:                False  
    Restart Count:         0  
    Environment:          <none>  
    Mounts:  
      /var/run/secrets/kubernetes.io/serviceaccount from default-token-fhfn8 (ro)  
Conditions:  
  Type        Status  
  Initialized  True  
  Ready       False
```

```

ContainersReady  False
PodScheduled    True
Volumes:
  default-token-fhfn8:
    Type:           Secret (a volume populated by a Secret)
    SecretName:    default-token-fhfn8
    Optional:      false
QoS Class:      BestEffort
Node-Selectors: <none>
Tolerations:   node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
                node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type  Reason     Age   From            Message
  ----  -----     --   --   -----
  Normal  Scheduled  80s  default-scheduler  Successfully assigned default/springboot
to minikube
  Normal  Pulling   79s  kubelet         Pulling image
  "127.0.0.1:5000/netkiller/config:latest"

```

## Taint (污点) 和 Toleration (容忍)

其目的是分配 pod 在集群间的调度，Taint 和 toleration 相互配合，可以用来避免 pod 被分配到某个节点上。这跟节点亲和性作用相反。

给 node 节点设置 label，通过给 pod 设置 nodeSelector 将 pod 调度到匹配标签的节点上。

如果设置 toleration 应用于 pod 上，则表示 pod 可以被调度到 taint 的节点上。

### Taint (污点) 设置

设置污点: kubectl taint node [node] key=value:[effect]

### effect 参数

1. NoSchedule：不能被调度。
2. PreferNoSchedule：尽量不要调度。
3. NoExecute：不允许该节点有 Pod。

在 shenzhen 节点上设置 Taint，键为 key，值为 value，effect 是 NoSchedule。

```
kubectl taint nodes shenzhen key=value:NoSchedule
```

这意味着除非 pod 只有明确声明 toleration 可以容忍这个 Taint，否则就不会被调度到该节点。

```

apiVersion: v1
kind: Pod
metadata:
  name: pod-taints
spec:

```

```
tolerations:
- key: "key"
  operator: "Equal"
  value: "value"
  effect: "NoSchedule"
containers:
- name: pod-taints
  image: busybox:latest
```

Toleration (容忍) 调度

key 存在即可匹配

```
spec:
tolerations:
- key: "key"
  operator: "Exists"
  effect: "NoSchedule"
```

key 必须存在，并且值等 value

```
spec:
tolerations:
- key: "key"
  operator: "Equal"
  value: "value"
  effect: "NoSchedule"
```

在pod上设置多个toleration:

```
spec:
tolerations:
- key: "key1"
  operator: "Equal"
  value: "value1"
  effect: "NoSchedule"
- key: "key2"
  operator: "Equal"
  value: "value2"
  effect: "NoExecute"
```

如果给node加上Taint effect=NoExecute的，该节点上的没有设置toleration的pod都会被立刻驱逐，设置tolerationSeconds 后会给 Pod 一个宽限期。

```
spec:  
  tolerations:  
    - key: "key"  
      operator: "Equal"  
      value: "value"  
      effect: "NoSchedule"  
      tolerationSeconds: 3600
```

## 使用场景

例如有些节点上挂了SSD，给redis,mongodb,mysql 使用，有些节点上安装了显卡GPU。就可以使用 taint

```
kubectl taint nodes shenzhen special=true:NoSchedule  
kubectl taint nodes guangdong special=true:PreferNoSchedule
```

## Pod

```
apiVersion: v1  
kind: Pod  
metadata:  
  name: counter  
spec:  
  containers:  
    - name: count  
      image: busybox  
      args: [/bin/sh, -c, 'i=0; while true; do echo "$i: $(date)"; i=$((i+1)); sleep 1; done']
```

## 创建 pod

```
iMac:kubernetes neo$ kubectl create -f pod.yaml  
pod/counter created  
  
iMac:kubernetes neo$ kubectl logs counter  
0: Sun Oct  4 12:32:44 UTC 2020  
1: Sun Oct  4 12:32:45 UTC 2020  
2: Sun Oct  4 12:32:46 UTC 2020  
3: Sun Oct  4 12:32:47 UTC 2020  
4: Sun Oct  4 12:32:48 UTC 2020  
5: Sun Oct  4 12:32:49 UTC 2020  
6: Sun Oct  4 12:32:50 UTC 2020  
7: Sun Oct  4 12:32:51 UTC 2020  
8: Sun Oct  4 12:32:52 UTC 2020  
9: Sun Oct  4 12:32:53 UTC 2020
```

## 容器编排

### 镜像拉取策略

imagePullPolicy: Always 总是拉取

imagePullPolicy: IfNotPresent 默认值,本地有则使用本地镜像,不拉取

imagePullPolicy: Never 只使用本地镜像, 从不拉取

### 指定主机名

```
apiVersion: v1
kind: Pod
metadata:
  name: hostaliases-pod
spec:
  restartPolicy: Never
  hostAliases:
  - ip: "127.0.0.1"
    hostnames:
    - "foo.local"
    - "bar.local"
  - ip: "10.1.2.3"
    hostnames:
    - "foo.remote"
    - "bar.remote"
  containers:
  - name: cat-hosts
    image: busybox
    command:
    - cat
    args:
    - "/etc/hosts"
```

### 环境变量

```
apiVersion: v1
kind: Pod
metadata:
  name: envars-fieldref
spec:
  containers:
  - name: test-container
    image: k8s.gcr.io/busybox
    command: [ "sh", "-c" ]
    args:
    - while true; do
        echo -en '\n';
        printenv NODE_NAME POD_NAME POD_NAMESPACE;
        printenv POD_IP POD_SERVICE_ACCOUNT;
        sleep 10;
    done;
  env:
```

```
- name: NODE_NAME
  valueFrom:
    fieldRef:
      fieldPath: spec.nodeName
- name: POD_NAME
  valueFrom:
    fieldRef:
      fieldPath: metadata.name
- name: POD_NAMESPACE
  valueFrom:
    fieldRef:
      fieldPath: metadata.namespace
- name: POD_IP
  valueFrom:
    fieldRef:
      fieldPath: status.podIP
- name: POD_SERVICE_ACCOUNT
  valueFrom:
    fieldRef:
      fieldPath: spec.serviceAccountName
restartPolicy: Never
```

```
apiVersion: v1
kind: Pod
metadata:
  name: envvars-resourcefieldref
spec:
  containers:
    - name: test-container
      image: k8s.gcr.io/busybox:1.24
      command: [ "sh", "-c" ]
      args:
        - while true; do
            echo -en '\n';
            printenv CPU_REQUEST CPU_LIMIT;
            printenv MEM_REQUEST MEM_LIMIT;
            sleep 10;
        done;
  resources:
    requests:
      memory: "32Mi"
      cpu: "125m"
    limits:
      memory: "64Mi"
      cpu: "250m"
  env:
    - name: CPU_REQUEST
      valueFrom:
        resourceFieldRef:
          containerName: test-container
          resource: requests.cpu
    - name: CPU_LIMIT
      valueFrom:
        resourceFieldRef:
          containerName: test-container
          resource: limits.cpu
    - name: MEM_REQUEST
      valueFrom:
```

```
        resourceFieldRef:
          containerName: test-container
          resource: requests.memory
      - name: MEM_LIMIT
        valueFrom:
          resourceFieldRef:
            containerName: test-container
            resource: limits.memory
    restartPolicy: Never
```

#### 健康状态检查

##### 就绪探针

```
readinessProbe:
  exec:
    command:
    - cat
    - /tmp/healthy
  initialDelaySeconds: 10          #10s之后开始第一次探测
  periodSeconds: 5                #第一次探测之后每隔5s探测一次
```

#### securityContext

##### sysctls

```
kubelet --allowed-unsafe-sysctls \
'kernel.msg*,net.core.somaxconn' ...
```

```
apiVersion: v1
kind: Pod
metadata:
  name: sysctl-example
spec:
  securityContext:
    sysctls:
    - name: kernel.shm_rmid_forced
      value: "0"
    - name: net.core.somaxconn
      value: "1024"
    - name: kernel.msgmax
      value: "65536"
```

##### runAsUser

allowPrivilegeEscalation 表示是否继承父进程权限， runAsUser 表示使用 UID 1000 的用户运行

```
apiVersion: v1
kind: Pod
metadata:
  name: security-context-demo
spec:
  securityContext:
    runAsUser: 1000
  containers:
    - name: sec-ctx-demo
      image: busybox:latest
      securityContext:
        runAsUser: 1000
        allowPrivilegeEscalation: false
```

```
spec:
  securityContext:
    runAsUser: 1000
    fsGroup: 2000
    runAsNonRoot: true
```

security.alpha.kubernetes.io/sysctls

security.alpha.kubernetes.io/sysctls

```
apiVersion: v1
kind: Pod
metadata:
  name: sysctl-example
  annotations:
    security.alpha.kubernetes.io/sysctls: kernel.shm_rmid_forced=1
spec:
```

unsafe-sysctls

```
apiVersion: v1
kind: Pod
metadata:
  name: sysctl-example
  annotations:
    security.alpha.kubernetes.io/unsafe-sysctls: net.core.somaxconn=65535
#使用unsafe sysctl, 设置最大连接数
spec:
  securityContext:
    privileged: true
#开启privileged权限
```

`nodeName` 选择节点

首先查看节点名称

```
[root@master ~]# kubectl get node
NAME      STATUS    ROLES          AGE     VERSION
agent-1   Ready     <none>        2d13h   v1.24.4+k3s1
master    Ready     control-plane,master 2d13h   v1.24.4+k3s1
agent-2   Ready     <none>        13h    v1.24.4+k3s1
```

使用 `nodeName: master` 选择节点

```
metadata:
  name: redis
  labels:
    app: redis
spec:
  replicas: 1
  serviceName: redis
  selector:
    matchLabels:
      app: redis
  template:
    metadata:
      labels:
        app: redis
    spec:
      containers:
        - name: redis
          image: redis:latest
          ports:
            - containerPort: 6379
      volumeMounts:
        - name: data
          mountPath: /data
        - name: config
          mountPath: /usr/local/etc/redis.conf
          subPath: redis.conf
      livenessProbe:
        tcpSocket:
          port: 6379
        initialDelaySeconds: 60
        failureThreshold: 3
        periodSeconds: 10
        successThreshold: 1
        timeoutSeconds: 5
      readinessProbe:
        tcpSocket:
          port: 6379
        initialDelaySeconds: 5
        failureThreshold: 3
        periodSeconds: 10
        successThreshold: 1
        timeoutSeconds: 5
  volumes:
```

```
- name: data
  persistentVolumeClaim:
    claimName: redis
- name: config
  configMap:
    name: redis
  nodeName: master
volumeClaimTemplates:
- metadata:
    name: data
  spec:
    accessModes:
      - ReadWriteOnce
    storageClassName: longhorn
  resources:
    requests:
      storage: 2Gi
apiVersion: apps/v1
kind: StatefulSet
```

**nodeSelector** 选择节点

首先给节点打标签，例如 disk-type=ssd

```
[root@master ~]# kubectl label nodes agent-1 disk-type:ssd
node/agent-1 labeled
```

查看标签

```
[root@master ~]# kubectl get node --show-labels
NAME      STATUS   ROLES      AGE      VERSION   LABELS
master    Ready    master    42d     v1.17.4   beta.kubernetes.io/arch=amd64,beta.kubernetes.io/os=linux,kubernetes.io/arch=amd64,kubernetes.io/hostname=master,kubernetes.io/os=linux,node-role.kubernetes.io/master=
agent-1   Ready    <none>   42d     v1.17.4   beta.kubernetes.io/arch=amd64,beta.kubernetes.io/os=linux,disk-
type:ssd,kubernetes.io/arch=amd64,kubernetes.io/hostname=agent-1,kubernetes.io/os=linux
agent-2   Ready    <none>   42d     v1.17.4   beta.kubernetes.io/arch=amd64,beta.kubernetes.io/os=linux,kubernetes.io/arch=amd64,kubernetes.io/hostname=agent-2,kubernetes.io/os=linux
```

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: busybox
  labels:
    app: busybox
spec:
  replicas: 5
```

```
selector:
  matchLabels:
    app: busybox
template:
  metadata:
    labels:
      app: busybox
spec:
  containers:
  - name: busybox
    image: busybox
    imagePullPolicy: IfNotPresent
    ports:
      - containerPort: 80
# 指定标签节点
nodeSelector:
  disk-type: ssd
```

## 删除标签

```
[root@master ~]# kubectl label nodes agent-1 disk-type-node/agent-1 unlabeled
```

## nodeAffinity 选择节点

nodeAffinity可对应的两种策略:  
preferredDuringScheduling(IgnoredDuringExecution / RequiredDuringExecution) 软策略  
requiredDuringScheduling(IgnoredDuringExecution / RequiredDuringExecution) 硬策略

operator 表达式  
In: label的值在某个列表中  
NotIn: label的值不在某个列表中  
Exists: 某个label存在  
DoesNotExist: 某个label不存在  
Gt: label的值大于某个值 (字符串比较)  
Lt: label的值小于某个值 (字符串比较)

## Taint (污点) 和 Toleration (容忍)

## strategy

滚动升级策略:

超过期望的Pod数量:1

不可用Pod最大数量:0

```
strategy:  
  rollingUpdate:  
    maxSurge: 1  
    maxUnavailable: 0  
  type: RollingUpdate
```

```
strategy:  
  type: RollingUpdate  
  rollingUpdate: {  
    maxUnavailable: 25%  
    maxSurge: 25%
```

## 8.2. expose

```
kubectl expose deployment nginx --port=88 --target-port=80 --type=NodePort --name=nginx-service  
kubectl describe service nginx-service
```

将服务暴露出去，在服务前面加一个负载均衡，因为pod可能分布在不同的结点上。

--port: 暴露出去的端口

--type=NodePort: 使用结点+端口方式访问服务

--target-port: 容器的端口

--name: 创建service指定的名称

```
kubectl expose deployment nginx --port=80 --target-port=8080 --type=NodePort  
kubectl expose deployment nginx --port=80 --target-port=8080 --type=LoadBalancer
```

## 8.3.

```
kubectl create deployment registry --image=registry:latest  
kubectl get deploy
```

## 8.4. 删除 deployment

```
kubectl delete deployment hello-minikube
```

## 8.5. 资源管理

```
kubectl scale -n default deployment nginx --replicas=1  
kubectl scale deployment springbootdemo --replicas=4  
kubectl scale deployment nginx --replicas=10
```

## 8.6. rollout

查看发布历史

```
kubectl rollout history deployment/nginx
```

指定版本号

```
kubectl rollout history deployment/nginx --revision=3
```

查看部署状态

```
kubectl rollout status deployment/nginx
```

回滚到上一个版本

```
kubectl rollout undo deployment/nginx-deployment
```

回滚到指定版本

```
kubectl rollout undo deployment/nginx-deployment --to-revision=3
```



## 9. 查看 pod 日志

```
kubectl logs <pod-name>
kubectl logs --previous <pod-name>
kubectl logs -l app=your-app-name | grep "xxx"
kubectl logs --selector role=cool-app | grep "xxx"
```

## 10. endpoints

```
Neo-iMac:kubernetes neo$ rancher kubectl get endpoints nginx
NAME      ENDPOINTS                               AGE
nginx    10.42.0.19:80,10.42.0.20:80,10.42.0.21:80  3m56s
```

## 11. 执行 Shell

进入容器内部.

```
$ kubectl get pods
NAME                  READY   STATUS    RESTARTS   AGE
mongodba-6d5d6ddf64-jw4fv   1/1     Running   0          16h

$ kubectl exec -it mongodba-6d5d6ddf64-jw4fv bash
```

```
kubectl run busybox --image=busybox:latest

iMac:kubernetes neo$ kubectl exec -it busybox -- nslookup
www.netkiller.cn
Server:          10.10.0.10
Address:         10.10.0.10:53

Non-authoritative answer:
www.netkiller.cn      canonical name = netkiller.github.io
Name:    netkiller.github.io
Address: 185.199.110.153
Name:    netkiller.github.io
Address: 185.199.108.153
Name:    netkiller.github.io
Address: 185.199.111.153
Name:    netkiller.github.io
Address: 185.199.109.153

*** Can't find www.netkiller.cn: No answer
```

## 12. edit

```
kubectl edit --namespace=kube-system rc kubernetes-dashboard
```

## 13. port-forward 端口映射

```
$ kubectl port-forward svc/demo 8080:8080
```

## 14. secret 密钥管理

### 14.1. 获取 Token

```
[gitlab-runner@agent-5 ~]$ kubectl get secrets -n gitlab -o jsonpath=".items[?(@.metadata.annotations['kubernetes\\.io/service-account\\.name']=='gitlab-runner')].data.token" | base64 -d  
eyJhbGciOiJSUzI1NiIsImtpZCI6IktCOHRvY1ZOLXFPRmEyblJWdlQxSzBvN0tvZF9HNFBGRnlraDR5  
UU1jakkifQ.eyJpc3MiOiJrdWJlcm5ldGVzL3NlcnpY2VhY2NvdW50Iiwia3ViZXJuZXRLcy5pbY9zz  
XJ2aWN1YWNjb3VudC9uYW1lc3BhY2UiOiJnaXRsyWIiLCJrdWJlcm5ldGVzLmlvL3NlcnpY2VhY2Nvd  
W50L3N1Y3JldC5uYW1lIjoIZ210bGFILXJ1bm5lc10b2tlbiIsImt1YmVybmV0ZXMuaw8vc2VydmljZ  
WFjY291bnQvc2VydmljZS1hY2NvdW50Lm5hbWUiOiJnaXRsyWItcnvubmVyiawi3ViZXJuZXRLcy5pb  
y9zzXJ2aWN1YWNjb3VudC9zZXJ2aWN1LWFjY291bnQudWlkIjoiN2NiOGY2MzctNzliNC00NzliLWFmM  
DMtNGE4ZDZkOWIzzjM5Iiwic3ViIjoic3lzdGvtOnNlcnpY2VhY2NvdW50OmdpdGxhYjpnaXRsyWItc  
nVubmVyIn0.pU4-  
8D4szeL8iud1SvesdN7nV7L3GLaNsa2UbsxkGQ4SDGN85zKTXJ16MtqDsujB9HBUL0TMnyEa0gCbgHOJ  
1R3fd2HcegitrRLeybvUuotniiLpCPO7vAO-oS5Fej7oUFBXqZJYIx-  
xMbFoyt3rnGs273c_yE8avI8EGdEPNhowRgF_GZBYstvwiejo2IUDWbutzCTtGloPvJ5Ur0s7drLjkCQ  
vt2nod5tSSnY5R0lpNyD2FodkFR28KU1EgFoHunH_ERtUAS5qObIETWSwm5SmCnd2Ogjh70DDxmIHSU-  
saFU0zSqPpZ1oX9hg09YMkcJXPHOEnqIVEagZ5CSf2w
```

### 14.2. 创建 Secret

```
$ cat <<EOF | kubectl create -f -  
apiVersion: v1  
kind: Secret  
metadata:  
  name: mysecret  
type: Opaque  
data:  
  password: $(echo "passw0rd" | base64)  
  username: $(echo "neo" | base64)  
EOF
```

### 14.3. Private Registry 用户认证

```
kubectl create secret docker-registry docker-hub \  
--docker-server=https://index.docker.io/v1/ \  
--docker-username=netkiller \  
--docker-password=password \  
--docker-email=netkiller@msn.com
```

```
iMac:spring neo$ kubectl get secret
NAME                  TYPE
default-token-fhfn8   kubernetes.io/service-account-token   3      2d23h
docker-hub            kubernetes.io/dockerconfigjson     1      15s
```

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: springboot
spec:
  replicas: 3
  selector:
    matchLabels:
      app: springboot
  template:
    metadata:
      labels:
        app: springboot
    spec:
      containers:
        - name: springboot
          image: netkiller/config:latest
          imagePullPolicy: IfNotPresent
          ports:
            - containerPort: 8888
      imagePullSecrets:
        - name: docker-hub
```

```
kubectl delete -n default secret docker-hub
```

#### 14.4. 配置TLS SSL

```
# 证书生成
mkdir cert && cd cert

# 生成 CA 自签证书

openssl genrsa -out ca-key.pem 2048
openssl req -x509 -new -nodes -key ca-key.pem -days 10000 -out ca.pem -subj
```

```
"/CN=kube-ca"

# 编辑 openssl 配置
cp /etc/pki/tls/openssl.cnf .
vim openssl.cnf

[req]
req_extensions = v3_req # 注释删掉
# 新增下面配置是
[ v3_req ]
basicConstraints = CA:FALSE
keyUsage = nonRepudiation, digitalSignature, keyEncipherment
subjectAltName = @alt_names
[ alt_names ]
DNS.1 = ns.netkiller.cn

# 生成证书
openssl genrsa -out ingress-key.pem 2048
openssl req -new -key ingress-key.pem -out ingress.csr -subj
"/CN=www.netkiller.cn" -config openssl.cnf
openssl x509 -req -in ingress.csr -CA ca.pem -CAkey ca-key.pem -CAcreateserial -
out ingress.pem -days 365 -extensions v3_req -extfile openssl.cnf
```

```
kubectl create secret tls ingress-secret --namespace=kube-system --key
cert/ingress-key.pem --cert cert/ingress.pem
```

## 15. ConfigMap

ConfigMap 用于保存配置数据的键值，也可以用来保存配置文件。

### 15.1. 创建 Key-Value 配置项

从key-value字符串创建ConfigMap

```
neo@MacBook-Pro-Neo ~ % kubectl create configmap config --from-literal=nickname=netkiller
configmap/config created
```

```
neo@MacBook-Pro-Neo ~ % kubectl get configmap config -o go-template='{{.data}}'
map[nickname:netkiller]
```

创建多个KV对

```
neo@MacBook-Pro-Neo ~ % kubectl create configmap user --from-literal=username=neo --from-
literal=nickname=netkiller --from-literal=age=35
configmap/user created

neo@MacBook-Pro-Neo ~ % kubectl get configmap user -o go-template='{{.data}}'
map[age:35 nickname:netkiller username:neo]%
```

```
neo@MacBook-Pro-Neo ~ % kubectl create configmap db-config --from-literal=db.host=172.16.0.10 -
--from-literal=db.port='3306'
configmap/db-config created
neo@MacBook-Pro-Neo ~ % kubectl describe configmap db-config
Name:           db-config
Namespace:      default
Labels:         <none>
Annotations:   <none>

Data
=====
db.port:
-----
3306
db.host:
-----
172.16.0.10
Events:        <none>
```

### 15.2. 从文件创建 ConfigMap

```
neo@MacBook-Pro-Neo ~ % kubectl create configmap passwd --from-file=/etc/passwd
configmap/passwd created

neo@MacBook-Pro-Neo ~ % kubectl describe configmap passwd
Name:          passwd
Namespace:     default
Labels:        <none>
Annotations:   <none>

Data
=====
passwd:
-----
## 
# User Database
#
# Note that this file is consulted directly only when the system is running
# in single-user mode. At other times this information is provided by
# Open Directory.
#
# See the opendirectoryd(8) man page for additional information about
# Open Directory.
##
nobody:*:-2:-2:Unprivileged User:/var/empty:/usr/bin/false
root:*:0:0:System Administrator:/var/root:/bin/sh
daemon:*:1:1:System Services:/var/root:/usr/bin/false
_uucp*:4:4:Unix to Unix Copy Protocol:/var/spool/uucp:/usr/sbin/uucico
taskgated*:13:13:Task Gate Daemon:/var/empty:/usr/bin/false
networkd*:24:24:Network Services:/var/networkd:/usr/bin/false
installassistant*:25:25:Install Assistant:/var/empty:/usr/bin/false
lp*:26:26:Printing Services:/var/spool/cups:/usr/bin/false
postfix*:27:27:Postfix Mail Server:/var/spool/postfix:/usr/bin/false
scsd*:31:31:Service Configuration Service:/var/empty:/usr/bin/false
ces*:32:32:Certificate Enrollment Service:/var/empty:/usr/bin/false
appstore*:33:33:Mac App Store Service:/var/db/appstore:/usr/bin/false
mcxalr*:54:54:MCX AppLaunch:/var/empty:/usr/bin/false
appleevents*:55:55:AppleEvents Daemon:/var/empty:/usr/bin/false
geod*:56:56:Geo Services Daemon:/var/db/geod:/usr/bin/false
devdocs*:59:59:Developer Documentation:/var/empty:/usr/bin/false
sandbox*:60:60:Seatbelt:/var/empty:/usr/bin/false
mdnsresponder*:65:65:mDNSResponder:/var/empty:/usr/bin/false
ard*:67:67:Apple Remote Desktop:/var/empty:/usr/bin/false
www*:70:70:World Wide Web Server:/Library/WebServer:/usr/bin/false
eppc*:71:71:Apple Events User:/var/empty:/usr/bin/false
cvs*:72:72:CVS Server:/var/empty:/usr/bin/false
svn*:73:73:SVN Server:/var/empty:/usr/bin/false
mysql*:74:74:MySQL Server:/var/empty:/usr/bin/false
sshd*:75:75:sshd Privilege separation:/var/empty:/usr/bin/false
qtss*:76:76:QuickTime Streaming Server:/var/empty:/usr/bin/false
cyrus*:77:6:Cyrus Administrator:/var/imap:/usr/bin/false
mailman*:78:78:Mailman List Server:/var/empty:/usr/bin/false
appserver*:79:79:Application Server:/var/empty:/usr/bin/false
clamav*:82:82:ClamAV Daemon:/var/virusmails:/usr/bin/false
amavisd*:83:83:AMaViS Daemon:/var/virusmails:/usr/bin/false
jabber*:84:84:Jabber XMPP Server:/var/empty:/usr/bin/false
appowner*:87:87:Application Owner:/var/empty:/usr/bin/false
windowserver*:88:88:WindowServer:/var/empty:/usr/bin/false
spotlight*:89:89:Spotlight:/var/empty:/usr/bin/false
tokend*:91:91:Token Daemon:/var/empty:/usr/bin/false
securityagent*:92:92:SecurityAgent:/var/db/securityagent:/usr/bin/false
calendar*:93:93:Calendar:/var/empty:/usr/bin/false
teamsserver*:94:94:TeamsServer:/var/teamsserver:/usr/bin/false
update_sharing*:95:-2:Update Sharing:/var/empty:/usr/bin/false
installer*:96:-2:Installer:/var/empty:/usr/bin/false
atsserver*:97:97:ATS Server:/var/empty:/usr/bin/false
ftp*:98:-2:FTP Daemon:/var/empty:/usr/bin/false
unknown*:99:99:Unknown User:/var/empty:/usr/bin/false
softwareupdate*:200:200:Software Update Service:/var/db/softwareupdate:/usr/bin/false
```

```
coreaudiod:::202:202:Core Audio Daemon:/var/empty:/usr/bin/false
screensaver:::203:203:Screensaver:/var/empty:/usr/bin/false
locationd:::205:205:Location Daemon:/var/db/locationd:/usr/bin/false
trustevaluationagent:::208:208:Trust Evaluation Agent:/var/empty:/usr/bin/false
timezone:::210:210:AutoTimeZoneDaemon:/var/empty:/usr/bin/false
lda:::211:211:Local Delivery Agent:/var/empty:/usr/bin/false
cvmsroot:::212:212:CVMS Root:/var/empty:/usr/bin/false
usbmuxd:::213:213:iPhone OS Device Helper:/var/db/lockdown:/usr/bin/false
dovecot:::214:6:Dovecot Administrator:/var/empty:/usr/bin/false
dpaudio:::215:215:DP Audio:/var/empty:/usr/bin/false
postgres:::216:216:PostgreSQL Server:/var/empty:/usr/bin/false
krbtgt:::217:-2:Kerberos Ticket Granting Ticket:/var/empty:/usr/bin/false
kadmin_admin:::218:-2:Kerberos Admin Service:/var/empty:/usr/bin/false
kadmin_changepw:::219:-2:Kerberos Change Password Service:/var/empty:/usr/bin/false
devicemgr:::220:220:Device Management Server:/var/empty:/usr/bin/false
webauthserver:::221:221:Web Auth Server:/var/empty:/usr/bin/false
netbios:::222:222:NetBIOS:/var/empty:/usr/bin/false
warmd:::224:224:Warm Daemon:/var/empty:/usr/bin/false
dovenull:::227:227:Dovecot Authentication:/var/empty:/usr/bin/false
netstatistics:::228:228:Network Statistics Daemon:/var/empty:/usr/bin/false
avbdeviced:::229:-2:Ethernet AVB Device Daemon:/var/empty:/usr/bin/false
krb_krbtgt:::230:-2:Open Directory Kerberos Ticket Granting Ticket:/var/empty:/usr/bin/false
krb_kadmin:::231:-2:Open Directory Kerberos Admin Service:/var/empty:/usr/bin/false
krb_changepw:::232:-2:Open Directory Kerberos Change Password
Service:/var/empty:/usr/bin/false
krb_kerberos:::233:-2:Open Directory Kerberos:/var/empty:/usr/bin/false
krb_anonymous:::234:-2:Open Directory Kerberos Anonymous:/var/empty:/usr/bin/false
assetcache:::235:235:Asset Cache Service:/var/empty:/usr/bin/false
coremediaiod:::236:236:Core Media IO Daemon:/var/empty:/usr/bin/false
launchservicesd:::239:239:_launchservicesd:/var/empty:/usr/bin/false
iconservices:::240:240:IconServices:/var/empty:/usr/bin/false
distnote:::241:241:DistNote:/var/empty:/usr/bin/false
nsurlsessiond:::242:242:NSURLSession Daemon:/var/db/nsurlsessiond:/usr/bin/false
displaypolicyd:::244:244:Display Policy Daemon:/var/empty:/usr/bin/false
astris:::245:245:Astris Services:/var/db/astris:/usr/bin/false
krbfast:::246:-2:Kerberos FAST Account:/var/empty:/usr/bin/false
gamecontrollerd:::247:247:Game Controller Daemon:/var/empty:/usr/bin/false
mbsetupuser:::248:248:Setup User:/var/setup:/bin/bash
ondemand:::249:249:On Demand Resource Daemon:/var/db/ondemand:/usr/bin/false
xserverdocs:::251:251:macOS Server Documents Service:/var/empty:/usr/bin/false
wwwproxy:::252:252:WWW Proxy:/var/empty:/usr/bin/false
mobileasset:::253:253:MobileAsset User:/var/ma:/usr/bin/false
findmydevice:::254:254:Find My Device Daemon:/var/db/findmydevice:/usr/bin/false
datadetectors:::257:257:DataDetectors:/var/db/datadetectors:/usr/bin/false
captiveagent:::258:258:captiveagent:/var/empty:/usr/bin/false
ctkd:::259:259:ctkd Account:/var/empty:/usr/bin/false
applepay:::260:260:applepay Account:/var/db/applepay:/usr/bin/false
hidd:::261:261:HID Service User:/var/db/hidd:/usr/bin/false
cmiodalassistants:::262:262:CoreMedia IO Assistants
User:/var/db/cmiodalassistants:/usr/bin/false
analyticsd:::263:263:Analytics Daemon:/var/db/analyticsd:/usr/bin/false
fpsd:::265:265:FPS Daemon:/var/db/fpsd:/usr/bin/false
timed:::266:266:Time Sync Daemon:/var/db/timed:/usr/bin/false
nearbyd:::268:268:Proximity and Ranging Daemon:/var/db/nearbyd:/usr/bin/false
reportmemoryexception:::269:269:ReportMemoryException:/var/db/reportmemoryexception:/usr/bin/false
driverkit:::270:270:DriverKit:/var/empty:/usr/bin/false
diskimagesiod:::271:271:DiskImages IO Daemon:/var/db/diskimagesiod:/usr/bin/false
logd:::272:272:Log Daemon:/var/db/diagnostics:/usr/bin/false
appinstallld:::273:273:App Install Daemon:/var/db/appinstallld:/usr/bin/false
installcoordination:::274:274:Install Coordination
Daemon:/var/db/installcoordination:/usr/bin/false
demod:::275:275:Demo Daemon:/var/empty:/usr/bin/false
rmd:::277:277:Remote Management Daemon:/var/db/rmd:/usr/bin/false
fud:::278:278:Firmware Update Daemon:/var/db/fud:/usr/bin/false
knowledgegraphd:::279:279:Knowledge Graph Daemon:/var/db/knowledgegraphd:/usr/bin/false
coreml:::280:280:CoreML Services:/var/empty:/usr/bin/false
oahd:::441:441:OAH Daemon:/var/empty:/usr/bin/false
```

```
Events: <none>
```

处理多个文件

```
neo@MacBook-Pro-Neo ~ % kubectl create configmap apache-httd --from-file=/etc/apache2/httd.conf --from-file=/etc/apache2/extr/apache2-vhosts.conf  
configmap/apache-httd created
```

处理目录内的所有文件

```
neo@MacBook-Pro-Neo ~ % kubectl create configmap apache-httd-users --from-file=/etc/apache2/users  
configmap/apache-httd-users created
```

### 15.3. 从环境变量文件创建 ConfigMap

```
cat <<EOF > /tmp/test.env  
username=neo  
nickname=netkiller  
age=38  
sex=Y  
EOF
```

```
neo@MacBook-Pro-Neo ~ % cat <<EOF > /tmp/test.env  
username=neo  
nickname=netkiller  
age=38  
sex=Y  
EOF  
neo@MacBook-Pro-Neo ~ % cat /tmp/test.env  
username=neo  
nickname=netkiller  
age=38  
sex=Y  
neo@MacBook-Pro-Neo ~ % kubectl create configmap env-config --from-env-file=/tmp/test.env  
configmap/env-config created
```

### 15.4. 查看 ConfigMap

```
neo@MacBook-Pro-Neo ~ % kubectl get configmap  
NAME      DATA   AGE  
config    1      52s
```

```
neo@MacBook-Pro-Neo ~ % kubectl describe configmap config
Name:           config
Namespace:      default
Labels:         <none>
Annotations:    <none>

Data
=====
nickname:
-----
netkiller
Events:  <none>
```

```
neo@MacBook-Pro-Neo ~ % kubectl get configmap config -o yaml
apiVersion: v1
data:
  nickname: netkiller
kind: ConfigMap
metadata:
  creationTimestamp: "2020-10-02T05:05:59Z"
  managedFields:
  - apiVersion: v1
    fieldsType: FieldsV1
    fieldsV1:
      f:data:
        .: {}
        f:nickname: {}
  manager: kubectl-create
  operation: Update
  time: "2020-10-02T05:05:59Z"
  name: config
  namespace: default
  resourceVersion: "18065"
  selfLink: /api/v1/namespaces/default/configmaps/config
  uid: 35381fa6-681b-417a-afc1-f45fdf5406d
```

```
neo@MacBook-Pro-Neo ~ % kubectl get configmap user -o json
{
  "apiVersion": "v1",
  "data": {
    "age": "35",
    "nickname": "netkiller",
    "username": "neo"
  },
  "kind": "ConfigMap",
  "metadata": {
    "creationTimestamp": "2020-10-02T05:13:09Z",
    "managedFields": [
      {
        "apiVersion": "v1",
        "fieldsType": "FieldsV1",
        "fieldsV1": {
          "f:data": {
            ".": {},
            "f:age": {},
            "f:nickname": {},
            "f:username": {}
          }
        }
      }
    ]
  }
}
```

```
        }
    },
    "manager": "kubectl-create",
    "operation": "Update",
    "time": "2020-10-02T05:13:09Z"
}
],
"name": "user",
"namespace": "default",
"resourceVersion": "18381",
"selfLink": "/api/v1/namespaces/default/configmaps/user",
"uid": "51e3aa61-21cf-4ed1-871c-ac7119aec7a1"
}
}
```

## 15.5. 删除 ConfigMap

```
neo@MacBook-Pro-Neo ~ % kubectl delete -n default configmap config
configmap "config" deleted
```

## 15.6. ConfigMap

### Key-Value 配置

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: db-config
  namespace: default
data:
  db.host: 172.16.0.10
  db.port: '3306'
  db.user: neo
  db.pass: chen
```

创建配置

```
neo@MacBook-Pro-Neo ~ /tmp/kubernetes % kubectl create -f key-value.yaml
configmap/db-config created
```

将配置项保存到文件

```
apiVersion: v1
kind: Pod
metadata:
  name: test-pod
spec:
  containers:
```

```
- name: test-container
  image: gcr.io/google_containers/busybox
  command: [ "/bin/sh", "-c", "cat /usr/local/etc/config/db.host" ]
  volumeMounts:
  - name: config-volume
    mountPath: /usr/local/etc/config
volumes:
- name: config-volume
  configMap:
    name: db-config
restartPolicy: Never
```

定义多组配置项

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: spring-cloud-config
  namespace: default
data:
  config: |
    spring.security.user=config
    spring.security.user=passw0rd
  eureka: |
    spring.security.user=eureka
    spring.security.user=passw0rd
  gateway: |
    spring.security.user=gateway
    spring.security.user=passw0rd
```

## Secret

制作私钥证书

```
openssl genrsa -out ingress.key 2048
```

制作公钥证书

```
openssl req -new -x509 -days 3650 -key ingress.key -out ingress.crt
```

生成 BASE64

```
neo@MacBook-Pro-Neo ~/workspace/devops/demo % base64 ingress.crt
LS0tLS1CRUdTIBDRVJUSUZJQ0FURS0tLS0tCk1JSURhRENDQWxBQ0NRRFdsvVG0x.....
neo@MacBook-Pro-Neo ~/workspace/devops/demo % base64 ingress.key
LS0tLS1CRUdTIBSU0EgUFJJVkJURSBLRVktLS0tLQpNSUlFb3dJQkFBS0NBUVB.....
```

```
apiVersion: v1
kind: Secret
metadata:
  name: tls
  namespace: development
data:
  tls.crt: LS0tLS1CRUdJTiBDRVJUSUZJQ0FURS0tLS0tCk1JSURhRENDQWxBQ0NRRFdsvG0x.....
  tls.key: LS0tLS1CRUdJTiBSU0EgUFJJVkfURSBLRVktLS0tLQpNSUlFb3dJQkFBS0NBUUVB.....
```

## 环境变量

envFrom 可将 ConfigMap 中的配置项定义为容器环境变量

```
apiVersion: v1
kind: Pod
metadata:
  name: neo-test-pod
spec:
  containers:
    - name: test-container
      image: k8s.gcr.io/busybox
      command: [ "/bin/sh", "-c", "env" ]
      envFrom:
        - configMapRef:
            name: special-config
  restartPolicy: Never
```

引用单个配置项使用 valueFrom

```
neo@MacBook-Pro-Neo ~/tmp/kubernetes % cat key-value.yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: db-config
  namespace: default
data:
  db.host: 172.16.0.10
  db.port: '3306'
  db.user: neo
  db.pass: chen
---
apiVersion: v1
kind: Pod
metadata:
  name: test-pod
spec:
  containers:
    - name: test-container
      image: busybox
      command: [ "/bin/sh", "-c", "env" ]
      env:
        - name: DBHOST
          valueFrom:
            configMapKeyRef:
              name: db-config
```

```
      key: db.host
- name: DBPORT
  valueFrom:
    configMapKeyRef:
      name: db-config
      key: db.port
  restartPolicy: Never

neo@MacBook-Pro-Neo ~/.tmp/kubernetes % kubectl create -f key-value.yaml
configmap/db-config created
pod/test-pod created
```

## 配置文件

### 定义配置

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: redis-config
  labels:
    app: redis
data:
  redis.conf: |-  
    pidfile /var/lib/redis/redis.pid  
    dir /var/lib/redis  
    port 6379  
    bind 0.0.0.0  
    appendonly yes  
    protected-mode no  
    requirepass 123456
```

### 引用配置

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: redis
  labels:
    app: redis
spec:
  replicas: 1
  selector:
    matchLabels:
      app: redis
  template:
    metadata:
      labels:
        app: redis
    spec:
      containers:
        - name: redis
          image: redis:5.0.8
          command:
            - "sh"
            - "-c"
            - "redis-server /usr/local/etc/redis/redis.conf"
      ports:
```

```
- containerPort: 6379
resources:
  limits:
    cpu: 1000m
    memory: 1024Mi
  requests:
    cpu: 1000m
    memory: 1024Mi
livenessProbe:
  tcpSocket:
    port: 6379
  initialDelaySeconds: 300
  timeoutSeconds: 1
  periodSeconds: 10
  successThreshold: 1
  failureThreshold: 3
readinessProbe:
  tcpSocket:
    port: 6379
  initialDelaySeconds: 5
  timeoutSeconds: 1
  periodSeconds: 10
  successThreshold: 1
  failureThreshold: 3
volumeMounts:
- name: data
  mountPath: /data
- name: config
  mountPath: /usr/local/etc/redis/redis.conf
  subPath: redis.conf
volumes:
- name: data
  persistentVolumeClaim:
    claimName: redis
- name: config
  configMap:
    name: redis-config
```

```
apiVersion: v1
kind: Pod
metadata:
  name: test-pod
spec:
  containers:
    - name: test-container
      image: gcr.io/google_containers/busybox
      command: [ "/bin/sh","-c","find /etc/config/" ]
      volumeMounts:
        - name: config-volume
          mountPath: /etc/config
  volumes:
    - name: config-volume
      configMap:
        name: special-config
        items:
          - key: special.how
            path: path/to/special-key
  restartPolicy: Never
```

# 16. Job/CronJob

## 16.1. CronJob

```
kubectl run hello --schedule="*/1 * * * *" --restart=OnFailure  
--image=busybox -- /bin/sh -c "date; echo Hello from the  
Kubernetes cluster"  
  
kubectl delete cronjob hello
```

## 16.2. Job

### 执行单词任务

.spec.completions 标志Job结束需要成功运行的Pod个数， 默认为1

.spec.parallelism 标志并行运行的Pod的个数， 默认为1

.spec.activeDeadlineSeconds 标志失败Pod的重试最大时间， 超过这个时间不会继续重试

```
apiVersion: batch/v1  
kind: Job  
metadata:  
  name: busybox  
spec:  
  completions: 1  
  parallelism: 1  
  template:  
    metadata:  
      name: busybox  
    spec:  
      containers:
```

```
- name: busybox
  image: busybox
  command: ["echo", "hello"]
  restartPolicy: Never
```

```
$ kubectl create -f job.yaml
job "busybox" created
$ pods=$(kubectl get pods --selector=job-name=busybox --
output=jsonpath={.items..metadata.name})
$ kubectl logs $pods
```

## 计划任务

.spec.schedule 指定任务运行周期，格式同Cron

.spec.startingDeadlineSeconds 指定任务开始的截止期限

.spec.concurrencyPolicy 指定任务的并发策略，支持Allow、Forbid和Replace三个选项

```
apiVersion: batch/v2alpha1
kind: CronJob
metadata:
  name: hello
spec:
  schedule: "*/1 * * * *"
  jobTemplate:
    spec:
      template:
        spec:
          containers:
            - name: hello
              image: busybox
              args:
```

```
- /bin/sh
- -c
- date; echo Hello from the Kubernetes cluster
restartPolicy: OnFailure
```

# 17. explain

## 17.1. ingress

```
iMac:kubernetes neo$ kubectl explain ingress
KIND:      Ingress
VERSION:   extensions/v1beta1

DESCRIPTION:
    Ingress is a collection of rules that allow inbound
connections to reach
        the endpoints defined by a backend. An Ingress can be
configured to give
            services externally-reachable urls, load balance traffic,
terminate SSL,
            offer name based virtual hosting etc. DEPRECATED - This
group version of
            Ingress is deprecated by networking.k8s.io/v1beta1 Ingress.
See the release
            notes for more information.

FIELDS:
    apiVersion  <string>
        APIVersion defines the versioned schema of this
representation of an
        object. Servers should convert recognized schemas to the
latest internal
        value, and may reject unrecognized values. More info:
        https://git.k8s.io/community/contributors/devel/sig-
architecture/api-conventions.md#resources

    kind <string>
        Kind is a string value representing the REST resource this
object
        represents. Servers may infer this from the endpoint the
client submits
        requests to. Cannot be updated. In CamelCase. More info:
        https://git.k8s.io/community/contributors/devel/sig-
architecture/api-conventions.md#types-kinds

    metadata      <Object>
```

```
Standard object's metadata. More info:  
https://git.k8s.io/community/contributors/devel/sig-  
architecture/api-conventions.md#metadata  
  
spec <Object>  
  Spec is the desired state of the Ingress. More info:  
  https://git.k8s.io/community/contributors/devel/sig-  
  architecture/api-conventions.md#spec-and-status  
  
status      <Object>  
  Status is the current state of the Ingress. More info:  
  https://git.k8s.io/community/contributors/devel/sig-  
  architecture/api-conventions.md#spec-and-status
```

## 查看 ingress.spec 配置清单

```
iMac:kubernetes neo$ kubectl explain ingress.spec  
KIND:     Ingress  
VERSION:  extensions/v1beta1  
  
RESOURCE: spec <Object>  
  
DESCRIPTION:  
  Spec is the desired state of the Ingress. More info:  
  https://git.k8s.io/community/contributors/devel/sig-  
  architecture/api-conventions.md#spec-and-status  
  
    IngressSpec describes the Ingress the user wishes to exist.  
  
FIELDS:  
  backend      <Object>  
    A default backend capable of servicing requests that don't  
    match any rule.  
    At least one of 'backend' or 'rules' must be specified.  
  This field is  
    optional to allow the loadbalancer controller or defaulting  
  logic to  
    specify a global default.  
  
  ingressClassName      <string>  
    IngressClassName is the name of the IngressClass cluster
```

```
resource. The
    associated IngressClass defines which controller will
implement the
    resource. This replaces the deprecated
`kubernetes.io/ingress.class`
    annotation. For backwards compatibility, when that
annotation is set, it
    must be given precedence over this field. The controller
may emit a warning
    if the field and annotation have different values.
Implementations of this
    API should ignore Ingresses without a class specified. An
IngressClass
    resource may be marked as default, which can be used to set
a default value
    for this field. For more information, refer to the
IngressClass
    documentation.

rules      <[ ]Object>
    A list of host rules used to configure the Ingress. If
unspecified, or no
    rule matches, all traffic is sent to the default backend.

tls   <[ ]Object>
    TLS configuration. Currently the Ingress only supports a
single TLS port,
    443. If multiple members of this list specify different
hosts, they will be
    multiplexed on the same port according to the hostname
specified through
    the SNI TLS extension, if the ingress controller fulfilling
the ingress
    supports SNI.
```

## 18. 操作系统资源配置

### 18.1. sysctls

```
kubelet --experimental-allowed-unsafe-sysctls  
'kernel.msg*,kernel.shmmax,kernel.sem,net.ipv4.route.min_pmtu'
```

## 19. 端口转发

将本地 0.0.0.0:27017 端口转发到 service 端口

```
neo@Netkiller-iMac ~> kubectl port-forward --address 0.0.0.0  
service/mongo 27017  
Forwarding from 0.0.0.0:27017 -> 27017
```

## 20. 更新镜像

更新资源对象的容器镜像

可使用资源对象包括（不区分大小写）：pod (po)、replicationcontroller (rc)、deployment (deploy)、daemonset (ds)、job、replicaset (rs)

```
kubectl set image deployment/nginx nginx=nginx:1.20.0  
kubectl set image deployment/nginx busybox=busybox nginx=nginx:1.10.1
```

携带参数

```
kubectl set image deployments,rc nginx=nginx:1.9.1 --all
```

使用通配符

```
kubectl set image daemonset abc *=nginx:1.9.1
```

## 21. 复制文件

```
kubectl cp netkiller/job-executor-77fc6b4db-  
5dzzx:logs/info.2022-07-29.log Downloads/info.2022-07-29.log -c  
job-executor
```

```
kubectl cp Downloads/myfile netkiller/job-executor-77fc6b4db-  
5dzzx:/tmp/myfile -c job-executor
```

## 22. describe

### 22.1. storageclasses.storage.k8s.io

```
[root@master ~]# kubectl describe storageclasses.storage.k8s.io
Name:                  longhorn-storage
IsDefaultClass:        No
Annotations:           <none>
Provisioner:           driver.longhorn.io
Parameters:
diskSelector=hdd,numberOfReplicas=2,staleReplicaTimeout=2880
AllowVolumeExpansion:  True
MountOptions:          <none>
ReclaimPolicy:         Delete
VolumeBindingMode:    Immediate
Events:                <none>

Name:                  longhorn
IsDefaultClass:        No
Annotations:           longhorn.io/last-applied-configmap=kind:
StorageClass
apiVersion:            storage.k8s.io/v1
metadata:
  name: longhorn
  annotations:
    storageclass.kubernetes.io/is-default-class: "true"
provisioner:            driver.longhorn.io
allowVolumeExpansion:   true
reclaimPolicy:          "Delete"
volumeBindingMode:     Immediate
parameters:
  numberOfReplicas:  "3"
  staleReplicaTimeout: "30"
  fromBackup:        ""
  fsType:            "ext4"
  dataLocality:      "disabled"
,storageclass.beta.kubernetes.io/is-default-
class=false,storageclass.kubernetes.io/is-default-class=false
Provisioner:            driver.longhorn.io
```

```

Parameters:
dataLocality=disabled,fromBackup=,fsType=ext4,numberOfReplicas=3,staleReplicaTimeout=30
AllowVolumeExpansion: True
MountOptions: <none>
ReclaimPolicy: Delete
VolumeBindingMode: Immediate
Events: <none>

Name: local-path
IsDefaultClass: Yes
Annotations:
objectset.rio.cattle.io/applied=H4sIAAAAAAAA/4yRT+vUMBCGv4rMu1
builtKwIOu7EUEQdDzNJlux6aZkkwry7LfXbIqrIffn2PyZN7hfXIFXPg7xcQSWE
BSiXimaupSxfJ2q6GAiYMDA9/+oKPHlKCAmRQdKoK5AoYgisoSUj5K/50sJtIqs
lQWVT3lNM4xUDzJ5VegWJ63CQxMTXogW128+czBvf/gnIQXIwLOBAa8WPTl30qv
GkoL2jw5rT2V6ZKUZij+SbG5eZVRDKR0F8SpdDTg6rW8YzCgcSW4FeCxJ/+sjxH
TCAbqrhmag20Pw9DbZtfu210z7JuhPnQ719m2w3c0e7fPof81W1DHfLlE2Th/IE
UwEDHYkWJe8PCsgJgL8PxVPNsLGPhEnjRr2cSvM33k4Dicv4jLC34g60nniWPSO
4S0zhTh9jsAAP//ytgh5S0CAAA,objectset.rio.cattle.io/id=,objectset.rio.cattle.io/owner-gvk=k3s.cattle.io/v1,
Kind=Addon,objectset.rio.cattle.io/owner-name=local-storage,objectset.rio.cattle.io/owner-namespace=kube-system,storageclass.beta.kubernetes.io/is-default-class=true,storageclass.kubernetes.io/is-default-class=true
Provisioner: rancher.io/local-path
Parameters: <none>
AllowVolumeExpansion: <unset>
MountOptions: <none>
ReclaimPolicy: Delete
VolumeBindingMode: WaitForFirstConsumer
Events: <none>

```

## 22.2. pod

```

[root@master ~]# kubectl describe pvc
Name:      elasticsearch-elasticsearch-data-0
Namespace: default
StorageClass: local-path

```

```
Status: Bound
Volume: pvc-a2ebce5a-9ae1-46e9-ae9f-8840027bf5d8
Labels: app=elasticsearch
         role=data
Annotations: pv.kubernetes.io/bind-completed: yes
             pv.kubernetes.io/bound-by-controller: yes
             volume.beta.kubernetes.io/storage-provisioner:
             rancher.io/local-path
             volume.kubernetes.io/selected-node: agent-1
             volume.kubernetes.io/storage-provisioner:
             rancher.io/local-path
Finalizers: [kubernetes.io/pvc-protection]
Capacity: 1Gi
Access Modes: RWO
VolumeMode: Filesystem
Used By:.elasticsearch-data-0
Events: <none>

Name:      elasticsearch-elasticsearch-data-1
Namespace: default
StorageClass: local-path
Status:    Bound
Volume:    pvc-f0d9d5df-9704-44a7-93ff-8a4f431af226
Labels:    app=elasticsearch
         role=data
Annotations: pv.kubernetes.io/bind-completed: yes
             pv.kubernetes.io/bound-by-controller: yes
             volume.beta.kubernetes.io/storage-provisioner:
             rancher.io/local-path
             volume.kubernetes.io/selected-node: master
             volume.kubernetes.io/storage-provisioner:
             rancher.io/local-path
Finalizers: [kubernetes.io/pvc-protection]
Capacity: 1Gi
Access Modes: RWO
VolumeMode: Filesystem
Used By:.elasticsearch-data-1
Events: <none>

Name:      elasticsearch-elasticsearch-data-2
Namespace: default
StorageClass: local-path
Status:    Bound
```

```
Volume:          pvc-722cce94-b2c5-457a-8e01-9a2a52b12128
Labels:          app=elasticsearch
                 role=data
Annotations:    pv.kubernetes.io/bind-completed: yes
                 pv.kubernetes.io/bound-by-controller: yes
                 volume.beta.kubernetes.io/storage-provisioner:
rancher.io/local-path
                 volume.kubernetes.io/selected-node: agent-1
                 volume.kubernetes.io/storage-provisioner:
rancher.io/local-path
Finalizers:     [kubernetes.io/pvc-protection]
Capacity:       1Gi
Access Modes:   RWO
VolumeMode:    Filesystem
Used By:        elasticsearch-data-2
Events:         <none>

Name:           longhorn-volv-pvc
Namespace:      default
StorageClass:   longhorn
Status:         Bound
Volume:         pvc-5dc3ae33-9f86-4650-82ba-a7b681963adc
Labels:         <none>
Annotations:    pv.kubernetes.io/bind-completed: yes
                 pv.kubernetes.io/bound-by-controller: yes
                 volume.beta.kubernetes.io/storage-provisioner:
driver.longhorn.io
                 volume.kubernetes.io/storage-provisioner:
driver.longhorn.io
Finalizers:     [kubernetes.io/pvc-protection]
Capacity:       2Gi
Access Modes:   RWO
VolumeMode:    Filesystem
Used By:        volume-test
Events:         <none>

Name:           redis
Namespace:      default
StorageClass:   local-path
Status:         Pending
Volume:
Labels:         <none>
Annotations:    <none>
```

```
Finalizers: [kubernetes.io/pvc-protection]
Capacity:
Access Modes:
VolumeMode: Filesystem
Used By: redis-0
Events:
  Type    Reason          Age   From
Message
  ----  -----  ----  -----
  Normal  WaitForFirstConsumer  29s (x481 over 120m)
persistentvolume-controller  waiting for first consumer to be
created before binding
[root@master ~]#
```

## 23. clusterrolebinding

```
kubectl create clusterrolebinding cluster-admin-binding --  
clusterrole cluster-admin --user [USER ACCOUNT]
```

## 24. Volume

PersistentVolume 的访问模式 (accessModes) 有三种:

ReadWriteOnce (RWO) : 是最基本的方式, 可读可写, 但只支持被单个节点挂载。

ReadOnlyMany (ROX) : 可以以只读的方式被多个节点挂载。

ReadWriteMany (RWX) : 这种存储可以以读写的方式被多个节点共享。不是每一种存储都支持这三种方式, 像共享方式, 目前支持的还比较少, 比较常用的是 NFS。在 PVC 绑定 PV 时通常根据两个条件来绑定, 一个是存储的大小, 另一个就是访问模式。

PersistentVolume 的回收策略 (persistentVolumeReclaimPolicy, 即 PVC 释放卷的时候 PV 该如何操作) 也有三种

Retain, 不清理, 保留 Volume (需要手动清理)

Recycle, 删除数据, 即 rm -rf /thevolume/\* (只有 NFS 和 HostPath 支持)

Delete, 删除存储资源, 比如删除 AWS EBS 卷 (只有 AWS EBS, GCE PD, Azure Disk 和 Cinder 支持)

### 24.1. local

```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: example-pv
spec:
  capacity:
    storage: 100Gi
    # volumeMode field requires BlockVolume Alpha feature gate to be
    # enabled.
    volumeMode: Filesystem
  accessModes:
    - ReadWriteOnce
  persistentVolumeReclaimPolicy: Delete
  storageClassName: local-storage
  local:
    path: /mnt/disks/ssd1
  nodeAffinity:
    required:
      nodeSelectorTerms:
        - matchExpressions:
          - key: kubernetes.io/hostname
```

```
operator: In
values:
- example-node
```

## 案例

```
apiVersion: storage.k8s.io/v1
kind: StorageClass
metadata:
  name: local-volume
provisioner: kubernetes.io/no-provisioner
volumeBindingMode: WaitForFirstConsumer
---
apiVersion: v1
kind: PersistentVolume
metadata:
  name: netkiller-local-pv
spec:
  capacity:
    storage: 1Gi
  accessModes:
    - ReadWriteOnce
  persistentVolumeReclaimPolicy: Retain
  storageClassName: local-volume
  local:
    path: /tmp/neo
  nodeAffinity:
    required:
      nodeSelectorTerms:
        - matchExpressions:
            - key: kubernetes.io/hostname
              operator: In
              values:
                - minikube
---
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: netkiller-pvc
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 1Gi
  storageClassName: local-volume
```

```
---
kind: Pod
apiVersion: v1
metadata:
  name: busybox
  namespace: default
spec:
  containers:
    - name: busybox
      image: busybox:latest
      # image: registry.netkiller.cn:5000/netkiller/welcome:latest
      imagePullPolicy: IfNotPresent
      command:
        - sleep
        - "3600"
      volumeMounts:
        - mountPath: "/srv"
          name: mypd
  restartPolicy: Always
  volumes:
    - name: mypd
      persistentVolumeClaim:
        claimName: netkiller-pvc
```

## 部署 POD

```
iMac:kubernetes neo$ kubectl create -f example/volume/local.yaml
storageclass.storage.k8s.io/local-volume created
persistentvolume/netkiller-local-pv created
persistentvolumeclaim/netkiller-pvc created
pod/busybox created
```

## 查看POD状态

```
iMac:kubernetes neo$ kubectl get pod
NAME      READY     STATUS    RESTARTS   AGE
busybox   1/1      Running   0          2m28s
```

进入POD查看local卷的挂载情况，同时创建一个测试文件。

```
iMac:kubernetes neo$ kubectl exec -it busybox sh
kubectl exec [POD] [COMMAND] is DEPRECATED and will be removed in a
future version. Use kubectl exec [POD] -- [COMMAND] instead.
/ # mount | grep /srv
tmpfs on /srv type tmpfs (rw)

/ # echo helloworld > /srv/netkiller
/ # cat /srv/netkiller
helloworld
```

进入宿主主机查看挂载目录

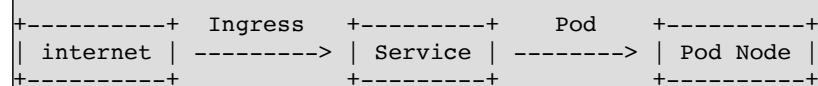
```
$ cat /tmp/neo/netkiller
helloworld
```

## 25. Ingress

正常情况 Service 只是暴露了端口，这个端口是可以对外访问的，但是80端口只有一个，很多 Service 都要使用 80端口，这时就需要使用虚拟主机技术。

多个 Service 共同使用一个 80 端口，通过域名区分业务。这就是 Ingress 存在的意义。

### 25.1. 端口



```
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: springboot
spec:
  backend:
    service:
      name: springboot
      port:
        number: 80
```

### 25.2. URI 规则

```
Ingress / ---> /api --> api-service:8080
www.netkiller.cn -----> |   ---> /usr --> usr-service:8080
                           \ ---> /img --> img-service:8080
```

```
apiVersion: networking.k8s.io/v1beta1
kind: Ingress
metadata:
  name: uri-ingress
  annotations:
    nginx.ingress.kubernetes.io/rewrite-target: /
spec:
  rules:
  - host: www.netkiller.cn
    http:
      paths:
      - path: /api
        backend:
```

```
    serviceName: api-service
    servicePort: 8080
  - path: /usr
    backend:
      serviceName: usr-service
      servicePort: 8080
  - path: /img
    backend:
      serviceName: img-service
      servicePort: 8080
```

### 25.3. vhost 虚拟主机

```
www.netkiller.cn --|     Ingress     | -> www.netkiller.cn www:80
                    |----->
img.netkiller.cn --|                         | -> img.netkiller.cn img:80
```

```
apiVersion: networking.k8s.io/v1beta1
kind: Ingress
metadata:
  name: vhost-ingress
spec:
  rules:
  - host: www.netkiller.cn
    http:
      paths:
      - backend:
          serviceName: www
          servicePort: 80
  - host: img.netkiller.cn
    http:
      paths:
      - backend:
          serviceName: img
          servicePort: 80
```

### 25.4. rewrite

```
http://www.netkiller.cn/1100 => /article/1100
```

```
apiVersion: networking.k8s.io/v1beta1
kind: Ingress
metadata:
  name: rewrite-ingress
  annotations:
```

```
nginx.ingress.kubernetes.io/rewrite-target: /article/$1
spec:
  rules:
  - host: www.netkiller.cn
    http:
      paths:
        # 可以有多个 (可以正则)
        - path: /($/.*)
          backend:
            serviceName: article
            servicePort: 80
```

## 25.5. annotations 配置

### HTTP 跳转到 HTTPS

```
# 该注解只在配置了HTTPS之后才会生效进行跳转
nginx.ingress.kubernetes.io/ssl-redirect: "true"

# 强制跳转到https, 不论是否配置了https证书
nginx.ingress.kubernetes.io/force-ssl-redirect: "true"
```

### server-snippet

server-snippet 可以让你直接编排 Nginx 配置

```
nginx.ingress.kubernetes.io/server-snippet: |
  rewrite /api/($|.* ) /api/v2/$1 break;
  rewrite /img/($|.* ) /img/thumbnaill/$1 break;
```

## 25.6. 金丝雀发布（灰度发布）

三种annotation按匹配优先级顺序：

```
canary-by-header > canary-by-cookie > canary-weight
```

### 准备服务

```
# Release Version
apiVersion: v1
kind: Service
```

```
metadata:
  name: hello-service
  labels:
    app: hello-service
spec:
ports:
- port: 80
  protocol: TCP
selector:
  app: hello-service
---
# canary Version
apiVersion: v1
kind: Service
metadata:
  name: canary-hello-service
  labels:
    app: canary-hello-service
spec:
ports:
- port: 80
  protocol: TCP
selector:
  app: canary-hello-service
```

## 方案一，权重分配

```
apiVersion: extensions/v1beta1
kind: Ingress
metadata:
  name: canary
  annotations:
    kubernetes.io/ingress.class: nginx
    nginx.ingress.kubernetes.io/canary: "true"
    nginx.ingress.kubernetes.io/canary-weight: "30"
spec:
  rules:
  - host: canary.netkiller.cn
    http:
      paths:
      - backend:
          serviceName: canary-hello-service
```

```
$ for i in $(seq 1 10); do curl http://canary.netkiller.cn; echo '\n'; done
```

## 通过HTTP头开启灰度发布

```
annotations:
```

```
kubernetes.io/ingress.class: nginx
nginx.ingress.kubernetes.io/canary: "true"
nginx.ingress.kubernetes.io/canary-by-header: "canary"
```

```
$ for i in $(seq 1 5); do curl -H 'canary:always' http://canary.netkiller.cn; echo '\n';
done
```

```
annotations:
kubernetes.io/ingress.class: nginx
nginx.ingress.kubernetes.io/canary: "true"
nginx.ingress.kubernetes.io/canary-by-header: "canary"
nginx.ingress.kubernetes.io/canary-by-header-value: "true"
```

```
$ for i in $(seq 1 5); do curl -H 'canary:true' http://canary.netkiller.cn; echo '\n';
done
```

## 通过 Cookie 开启

```
annotations:
kubernetes.io/ingress.class: nginx
nginx.ingress.kubernetes.io/canary: "true"
nginx.ingress.kubernetes.io/canary-by-cookie: "canary"
```

```
$ for i in $(seq 1 5); do curl -b 'canary=always' http://canary.netkiller.cn; echo '\n';
done
```

## 25.7. 管理 Ingress

```
# 查看已有配置
kubectl describe ingress test

# 修改配置
kubectl edit ingress test

# 来重新载入配置
kubectl replace -f ingress.yaml
```



# 第 6 章 kubectl example

## 1. 私有 registry

```
kubectl create deployment registry --image=registry:latest  
kubectl expose deployment registry --port=5000 --target-  
port=5000  
kubectl delete -n default deployment registry
```

```
iMac:registry neo$ docker pull nginx:latest  
iMac:registry neo$ docker tag nginx:latest  
192.168.64.2:30050/nginx:latest  
iMac:registry neo$ docker push 192.168.64.2:30050/nginx:latest  
  
kubectl create deployment nginx --  
image=192.168.64.2:30050/nginx:latest  
kubectl expose deployment nginx --port=80 --target-port=30080 --  
type=NodePort  
  
kubectl create deployment busybox --image=docker.io/busybox  
kubectl create deployment busybox --image=busybox  
kubectl create deployment welcome --  
image=127.0.0.1:5000/netkiller/welcome  
  
docker tag busybox:latest 192.168.64.6:32070/busybox:latest  
docker push 192.168.64.6:32070/busybox:latest
```

## 2. mongodb

```
kubectl run mongodb --image=docker.io/mongo --  
env="p='27017:27017'" --env="v='/opt/mongodb:/data'"  
kubectl expose deployment mongodb --port=27017 --target-  
port=27017
```

### 3. tomcat

```
kubectl create deployment hello-minikube --image=tomcat:8.0
kubectl expose deployment hello-minikube --type=NodePort --
port=80
minikube service hello-minikube --url
```

# 第 7 章 istio

## 1. 启动 istio

下面的例子是在 default 命名空间启用 istio。

```
$ kubectl label namespace default istio-injection=enabled  
namespace/default labeled
```

## 2. 禁用 istio

如果在该namespace下创建pod，不想要使用istio-proxy，可以在创建的pod中annotations 配置项声明禁用 istio

```
apiVersion: v1
kind: Pod
metadata:
  annotations:
    sidecar.istio.io/inject: "false"
```

## 第 8 章 Kubeapps

Kubeapps is a web-based UI for deploying and managing applications in Kubernetes clusters

<https://kubeapps.com>

# 第 9 章 Helm - The package manager for Kubernetes

<https://helm.sh>

## 1. 安装 Helm

### 1.1. AlmaLinux

CURL 安装

```
curl  
https://raw.githubusercontent.com/helm/helm/main/scripts/get-helm-3 | bash
```

二进制安装

```
cd /usr/local/src/  
wget https://get.helm.sh/helm-v3.9.4-linux-amd64.tar.gz  
tar zxvf helm-v3.9.4-linux-amd64.tar.gz  
mv linux-amd64 /srv/helm-v3.9.4  
alternatives --install /usr/local/bin/helm helm /srv/helm-v3.9.4/helm 10
```

### 1.2. Rocky Linux

```
[root@netkiller ~]# dnf install -y snapd  
[root@netkiller ~]# ln -s /var/lib/snapd/snap /snap
```

```
[root@netkiller ~]# systemctl enable --now snapd.socket
[root@netkiller ~]# systemctl start --now snapd.socket
[root@netkiller ~]# snap install helm --classic
```

```
cat >> /etc/profile.d/snap.sh <<EOF
export PATH=$PATH:/snap/bin
EOF
source /etc/profile.d/snap.sh
```

### 1.3. Ubuntu

```
snap install helm --classic
```

### 1.4. Mac

homebrew 安裝 Helm

```
iMac:~ neo$ brew install helm

iMac:~ neo$ helm version
version.BuildInfo{Version:"v3.3.3",
GitCommit:"55e3ca022e40fe200fbc855938995f40b2a68ce0",
GitTreeState:"dirty", GoVersion:"go1.15.2"}
```

旧版本

```
brew install kubernetes-helm
```

## 2. 快速开始

```
# 初始化本地，并将 Tiller 安装到 Kubernetes cluster
$ helm init

# 更新本地 charts repo
$ helm repo update

# 安装 mysql chart
$ helm install --name my-mysql stable/mysql

# 删除 mysql
$ helm delete my-mysql

# 删除 mysql 并释放该名字以便后续使用
$ helm delete --purge my-mysql
```

## 3. Helm 命令

### 3.1. 初始化 Helm

```
neo@MacBook-Pro ~ % helm init
Creating /Users/neo/.helm
Creating /Users/neo/.helm/repository
Creating /Users/neo/.helm/repository/cache
Creating /Users/neo/.helm/repository/local
Creating /Users/neo/.helm/plugins
Creating /Users/neo/.helm/starters
Creating /Users/neo/.helm/cache/archive
Creating /Users/neo/.helm/repository/repositories.yaml
Adding stable repo with URL: https://kubernetes-charts.storage.googleapis.com
Adding local repo with URL: http://127.0.0.1:8879/charts
$HELM_HOME has been configured at /Users/neo/.helm.
Warning: Tiller is already installed in the cluster.
(Use --client-only to suppress this message, or --upgrade to upgrade Tiller to the current
version.)
Happy Helming!
```

### 3.2. 查看仓库列表

查看当前的 Charts 包仓库

```
neo@MacBook-Pro ~ % helm repo list
NAME      URL
stable   https://kubernetes-charts.storage.googleapis.com
local    http://127.0.0.1:8879/charts
```

更新仓库

```
neo@MacBook-Pro ~ % helm repo update
Hang tight while we grab the latest from your chart repositories...
...Skip local chart repository
...Unable to get an update from the "stable" chart repository (https://kubernetes-
charts.storage.googleapis.com):
        unexpected EOF
Update Complete. * Happy Helming!*
```

### 3.3. 搜索

在stable仓库搜索 redis应用

```
neo@MacBook-Pro ~ % helm search stable/redis
NAME          CHART VERSION  APP VERSION      DESCRIPTION
stable/redis  6.4.3         4.0.14          Open source, advanced key-value store. It is
often referr...
```

```
stable/redis-ha 3.3.3           5.0.3           Highly available Kubernetes implementation of  
Redis
```

### 3.4. 查看包信息

查看包详细信息与帮助手册

```
neo@MacBook-Pro ~ % helm inspect stable/redis
```

### 3.5. 安装

```
$ helm install stable/redis  
$ helm install --name=redis stable/redis
```

```
neo@MacBook-Pro ~ % helm install stable/redis  
NAME:   vested-termite  
LAST DEPLOYED: Sun Mar 31 17:46:02 2019  
NAMESPACE: default  
STATUS: DEPLOYED  
  
RESOURCES:  
==> v1/ConfigMap  
NAME          DATA  AGE  
vested-termite-redis    3     0s  
vested-termite-redis-health 3     0s  
  
==> v1/Pod(related)  
NAME                      READY  STATUS      RESTARTS  AGE  
vested-termite-redis-master-0  0/1    Pending      0         0s  
vested-termite-redis-slave-57584f877-8njkc  0/1    ContainerCreating  0         0s  
  
==> v1/Secret  
NAME          TYPE    DATA  AGE  
vested-termite-redis  Opaque  1     0s  
  
==> v1/Service  
NAME          TYPE      CLUSTER-IP      EXTERNAL-IP  PORT(S)  AGE  
vested-termite-redis-master  ClusterIP  10.98.194.187  <none>     6379/TCP  0s  
vested-termite-redis-slave   ClusterIP  10.111.85.208  <none>     6379/TCP  0s  
  
==> v1beta1/Deployment  
NAME          READY  UP-TO-DATE  AVAILABLE  AGE  
vested-termite-redis-slave  0/1    1          0         0s  
  
==> v1beta2/StatefulSet  
NAME          READY  AGE  
vested-termite-redis-master 0/1    0s  
  
NOTES:  
** Please be patient while the chart is being deployed **  
Redis can be accessed via port 6379 on the following DNS names from within your cluster:  
vested-termite-redis-master.default.svc.cluster.local for read/write operations
```

```

vested-termite-redis-slave.default.svc.cluster.local for read-only operations

To get your password run:

  export REDIS_PASSWORD=$(kubectl get secret --namespace default vested-termite-redis -o
jsonpath="{.data.redis-password}" | base64 --decode)

To connect to your Redis server:

1. Run a Redis pod that you can use as a client:

  kubectl run --namespace default vested-termite-redis-client --rm --tty -i --restart='Never'
  \
    --env REDIS_PASSWORD=$REDIS_PASSWORD \
    --image docker.io/bitnami/redis:4.0.14 -- bash

2. Connect using the Redis CLI:
  redis-cli -h vested-termite-redis-master -a $REDIS_PASSWORD
  redis-cli -h vested-termite-redis-slave -a $REDIS_PASSWORD

To connect to your database from outside the cluster execute the following commands:

  kubectl port-forward --namespace default svc/vested-termite-redis 6379:6379 &
  redis-cli -h 127.0.0.1 -p 6379 -a $REDIS_PASSWORD

```

### 3.6. 列表

```

neo@MacBook-Pro ~ % helm list
NAME          Revision        Updated           Status      Chart
APP VERSION   Namespace
vested-termite 1            Sun Mar 31 17:46:02 2019  DEPLOYED  redis-6.4.3
4.0.14        default

```

### 3.7. 删除

```

helm ls --all
helm delete --purge redis

```

### 3.8. 升级

```

helm upgrade -f redis-ha-values-upgrade.yaml redis-ha stable/redis-ha

```

### 3.9. 回滚

```

helm rollback redis-ha 1

```

### 3.10. 查看状态

```
neo@MacBook-Pro ~ % helm list
NAME          Revision        Updated
APP VERSION   Namespace
vested-termite 1           Sun Mar 31 17:46:02 2019
4.0.14        default
                STATUS      CHART
DEPLOYED      redis-6.4.3

neo@MacBook-Pro ~ % helm status vested-termite
LAST DEPLOYED: Sun Mar 31 17:46:02 2019
NAMESPACE: default
STATUS: DEPLOYED

RESOURCES:
==> v1/ConfigMap
NAME          DATA  AGE
vested-termite-redis  3    111m
vested-termite-redis-health 3    111m

==> v1/Pod(related)
NAME          READY  STATUS  RESTARTS  AGE
vested-termite-redis-master-0  1/1    Running  0       111m
vested-termite-redis-slave-57584f877-8njkc  1/1    Running  0       111m

==> v1/Secret
NAME          TYPE  DATA  AGE
vested-termite-redis  Opaque  1    111m

==> v1/Service
NAME          TYPE      CLUSTER-IP      EXTERNAL-IP  PORT(S)  AGE
vested-termite-redis-master  ClusterIP  10.98.194.187  <none>     6379/TCP  111m
vested-termite-redis-slave   ClusterIP  10.111.85.208  <none>     6379/TCP  111m

==> v1beta1/Deployment
NAME          READY  UP-TO-DATE  AVAILABLE  AGE
vested-termite-redis-slave  1/1    1          1          111m

==> v1beta2/StatefulSet
NAME          READY  AGE
vested-termite-redis-master 1/1    111m

NOTES:
** Please be patient while the chart is being deployed **
Redis can be accessed via port 6379 on the following DNS names from within your cluster:
vested-termite-redis-master.default.svc.cluster.local for read/write operations
vested-termite-redis-slave.default.svc.cluster.local for read-only operations

To get your password run:

  export REDIS_PASSWORD=$(kubectl get secret --namespace default vested-termite-redis -o
jsonpath="{.data.redis-password}" | base64 --decode)

To connect to your Redis server:

1. Run a Redis pod that you can use as a client:

  kubectl run --namespace default vested-termite-redis-client --rm --tty -i --restart='Never'
\
```

```
--env REDIS_PASSWORD=$REDIS_PASSWORD \
--image docker.io/bitnami/redis:4.0.14 -- bash

2. Connect using the Redis CLI:
redis-cli -h vested-termite-redis-master -a $REDIS_PASSWORD
redis-cli -h vested-termite-redis-slave -a $REDIS_PASSWORD

To connect to your database from outside the cluster execute the following commands:

kubectl port-forward --namespace default svc/vested-termite-redis 6379:6379 &
redis-cli -h 127.0.0.1 -p 6379 -a $REDIS_PASSWORD
```

## 4. ingress-nginx

```
helm repo add ingress-nginx  
https://kubernetes.github.io/ingress-nginx  
helm repo update
```

安装 ingress-nginx 并且设置为默认 ingress

```
helm upgrade --install ingress-nginx ingress-nginx/ingress-  
nginx \  
--namespace ingress-nginx --set  
controller.service.type=LoadBalancer \  
--set controller.ingressClassResource.default=true \  
--set controller.watchIngressWithoutClass=true \  
--create-namespace
```

让Nginx获取客户端IP地址，找到spec下的externalTrafficPolicy，  
把值改为Local。

```
kubectl edit service/ingress-nginx-controller --namespace  
ingress-nginx
```

## 5. elastic

```
helm repo add elastic https://helm.elastic.co
```

## **6. Helm The package manager for Kubernetes**

<https://helm.sh>

## **7. Helm Faq**

# 第 10 章 Rancher - Multi-Cluster Kubernetes Management

*Rancher is open-source software for delivering Kubernetes-as-a-Service.*

## 1. 安装 Rancher

### 1.1. Rancher Server

#### Docker 安装

如果只是学习，可以安装最新版

```
docker run -d --privileged --restart=unless-stopped -p 80:80 -p 443:443 --name=rancher rancher/rancher:latest
```

稳定版

```
docker run -d --privileged --restart=unless-stopped -p 80:80 -p 443:443 -v /var/lib/rancher/:/var/lib/rancher/ --name=rancher rancher/rancher:stable
```

审计日志

```
docker run -d --restart=unless-stopped -p 80:80 -p 443:443 -v /var/lib/rancher/:/var/lib/rancher/ -v /var/log/auditlog:/var/log/auditlog --name=rancher rancher/rancher:stable
```

防火墙配置

防火墙放行 etcd

```
iptables -I INPUT -s 172.16.0.0/0 -p tcp --dport 2379 -j ACCEPT
iptables -I INPUT -s 172.16.0.0/0 -p tcp --dport 2380 -j ACCEPT
```

```
systemctl restart firewalld
systemctl enable firewalld

iptables -A INPUT -p tcp --dport 6443 -j ACCEPT
iptables -A INPUT -p tcp --dport 2379 -j ACCEPT
iptables -A INPUT -p tcp --dport 2380 -j ACCEPT
iptables -A INPUT -p tcp --dport 10250 -j ACCEPT

firewall-cmd --zone=public --add-port=6443/tcp --permanent
firewall-cmd --zone=public --add-port=2379/tcp --permanent
firewall-cmd --zone=public --add-port=2380/tcp --permanent
firewall-cmd --zone=public --add-port=10250/tcp --permanent
firewall-cmd --reload
```

从阿里云安装

```
docker run -itd -p 80:80 -p 443:443 \
--restart=unless-stopped \
-e CATTLE_AGENT_IMAGE="registry.cn-hangzhou.aliyuncs.com/rancher/rancher-
agent:v2.4.2" \
registry.cn-hangzhou.aliyuncs.com/rancher/rancher
```

仅用 unsupported-storage-drivers

```
[root@localhost ~]# docker run -d --privileged --restart=unless-stopped -p 8080:80
-p 8443:443 --name=rancher --env unsupported-storage-drivers=true
rancher/rancher:stable
[root@localhost ~]# docker run -d --privileged --restart=unless-stopped -p 8080:80
-p 8443:443 --name=rancher rancher/rancher:stable --features=unsupported-storage-
drivers=true
```

Helm 安装 Rancher

安装 k3s

```
hostnamectl set-hostname master
curl -sfL https://rancher-mirror.oss-cn-beijing.aliyuncs.com/k3s/k3s-install.sh |
INSTALL_K3S_MIRROR=cn sh -
```

安装最新版

```
helm repo add rancher-latest https://releases.rancher.com/server-charts/latest
```

安装用于生产环境的稳定版

```
helm repo add rancher-stable https://releases.rancher.com/server-charts/stable
```

创建命名空间

```
kubectl create namespace cattle-system
```

安装 cert-manager

```
kubectl apply -f https://github.com/cert-manager/cert-
manager/releases/download/v1.7.1/cert-manager.crds.yaml

helm repo add jetstack https://charts.jetstack.io

helm repo update

helm install cert-manager jetstack/cert-manager \
--namespace cert-manager \
--create-namespace \
--version v1.7.1
```

```
helm install rancher rancher-stable/rancher \
--create-namespace \
--namespace cattle-system \
--set hostname=rancher.netkiller.cn \
--set ingress.tls.source=letsEncrypt \
--set bootstrapPassword=admin \
--set replicas=1 \
--set systemDefaultRegistry=registry.cn-hangzhou.aliyuncs.com
```

Mac 安装

```
Neo-iMac:~ neo$ brew install rancher-cli  
Neo-iMac:~ neo$ rancher -v  
rancher version 2.4.13
```

进入容器

```
$ docker exec -it rancher /bin/bash
```

## Web UI

安装完之后运行下面命令查看密码

```
[root@localhost ~]# docker logs rancher 2>&1 | grep "Bootstrap Password:"  
2021/11/26 10:27:14 [INFO] Bootstrap Password:  
wkz68vmmx4gqfwxwzq4vxrzl5zgjqxlmxkfwkdltmpkx15clqc9dw9
```

浏览器输入 <https://your-ip-address> 即可进入 WebUI



设置密码



## SSL 证书

第一种方式

```
docker run -d -p 8443:443 -v /srv/rancher/cacerts.pem:/etc/rancher/ssl/cacerts.pem  
-v /srv/rancher/key.pem:/etc/rancher/ssl/key.pem -v  
/srv/rancher/cert.crt:/etc/rancher/ssl/cert.pem rancher/rancher:latest
```

第二种方式

```
docker run -d --name rancher-server rancher/rancher:latest
docker run -d --name=nginx --restart=unless-stopped -p 80:80 -p 443:443 -v
/your_certificates:/your_certificates -v
/etc/nginx.conf:/etc/nginx/conf.d/default.conf --link=rancher-server nginx:1.11
```

## 1.2. Rancher Kubernetes Engine (RKE) 2

### Server

```
curl -sfL https://get.rke2.io | sh -
```

```
systemctl enable rke2-server.service
systemctl start rke2-server.service
```

### Linux Agent (Worker)

```
curl -sfL https://get.rke2.io | INSTALL_RKE2_TYPE="agent" sh -
```

```
systemctl enable rke2-agent.service
```

### 配置 rke2-agent 服务

```
mkdir -p /etc/rancher/rke2/
vim /etc/rancher/rke2/config.yaml

server: https://<server>:9345
token: <token from server node>
```

```
systemctl start rke2-agent.service
```

### 1.3. Rancher Kubernetes Engine (RKE) 1

<https://github.com/rancher/rke/releases>

<https://rancher.com/an-introduction-to-rke/>

#### 安装 RKE

v1.3.2

```
cd /usr/local/src/
wget https://github.com/rancher/rke/releases/download/v1.3.2/rke_linux-amd64
mkdir -p /srv/rancher/bin
install rke_linux-amd64 /srv/rancher/bin/
```

v0.1.17

```
[root@localhost ~]# wget
https://github.com/rancher/rke/releases/download/v0.1.17/rke
[root@localhost ~]# chmod +x rke
[root@localhost ~]# ./rke --version
rke version v0.1.17
```

#### 配置 RKE

```
[root@localhost ~]# /srv/rancher/bin/rke_linux-amd64 config
[+] Cluster Level SSH Private Key Path [~/.ssh/id_rsa]:
```

#### 启动 RKE

```
[root@localhost ~]# /srv/rancher/bin/rke_linux-amd64 up
```

### 1.4. Rancher CLI

## 二进制安装

<http://mirror.cnrancher.com>

```
cd /usr/local/src
wget http://rancher-mirror.cnrancher.com/cli/v2.4.13/rancher-linux-amd64-
v2.4.13.tar.xz
tar Jxvf rancher-linux-amd64-v2.4.13.tar.xz
install rancher-v2.4.13/rancher /usr/local/bin/
```

```
[root@localhost src]# rancher
Rancher CLI, managing containers one UTF-8 character at a time

Usage: rancher [OPTIONS] COMMAND [arg...]

Version: v2.4.13

Options:
  --debug                  Debug logging
  --config value, -c value Path to rancher config (default: "/root/.rancher")
[ $RANCHER_CONFIG_DIR ]
  --help, -h                show help
  --version, -v              print the version

Commands:
  apps, [app]               Operations with apps. Uses
  helm. Flags prepended with "helm" can also be accurately described by helm
  documentation.
  catalog                   Operations with catalogs
  clusters, [cluster]       Operations on clusters
  context                   Operations for the context
  globaldns                 Operations on global DNS
  providers and entries
    inspect                 View details of resources
    kubectl                 Run kubectl commands
    login, [l]               Login to a Rancher server
    multicloudapps, [multicloudapp mcapps mcapp] Operations with multi-cluster
  apps
    namespaces, [namespace] Operations on namespaces
    nodes, [node]            Operations on nodes
    projects, [project]     Operations on projects
    ps                      Show workloads in a project
    server                  Operations for the server
    settings, [setting]     Show settings for the current
  server
    ssh                     SSH into a node
    up                      apply compose config
    wait                    Wait for resources cluster,
  app, project, multicloudApp
    token                  Authenticate and generate new
  kubeconfig token
```

```
help, [h]                                         Shows a list of commands or
help for one command

Run 'rancher COMMAND --help' for more information on a command.
```

## 1.5. rancher-compose

Rancher Compose是一个多主机版本的Docker Compose

下载地址: <https://github.com/rancher/rancher-compose/releases>

### v0.12.5

```
cd /tmp

wget https://github.com/rancher/rancher-compose/releases/download/v0.12.5/rancher-
compose-linux-amd64-v0.12.5.tar.xz
tar Jxvf rancher-compose-linux-amd64-v0.12.5.tar.xz
mv ./rancher-compose-v0.12.5/rancher-compose /usr/local/bin/

cd
```

## 2. 快速入门

<https://www.cnrancher.com/docs/rancher/v2.x/cn/overview/quick-start-guide/>



### 2.1. API



## 3. Rancher Compose

Rancher Compose 工具的工作方式是跟 Docker Compose 的工作方式是相似的，Docker Compose 不能远程部署，Rancher Compose 可以部署到指定URL的 Rancher 上。

```
[root@localhost ~]# rancher-compose
Usage: rancher-compose [OPTIONS] COMMAND [arg...]

Docker-compose to Rancher

Version: v0.12.5

Author:
  Rancher Labs, Inc.

Options:
  --verbose, --debug
  --file value, -f value      Specify one or more alternate compose files (default: docker-compose.yml) [$COMPOSE_FILE]
  --project-name value, -p value  Specify an alternate project name (default: directory name) [$COMPOSE_PROJECT_NAME]
  --url value                  Specify the Rancher API endpoint URL [$RANCHER_URL]
  --access-key value          Specify Rancher API access key [$RANCHER_ACCESS_KEY]
  --secret-key value          Specify Rancher API secret key [$RANCHER_SECRET_KEY]
  --rancher-file value, -r value  Specify an alternate Rancher compose file (default: rancher-compose.yml)
  --env-file value, -e value    Specify a file from which to read environment variables
  --bindings-file value, -b value  Specify a file from which to read bindings
  --help, -h                     show help
  --version, -v                 print the version

Commands:
  create      Create all services but do not start
  up          Bring all services up
  start       Start services
  logs        Get service logs
  restart     Restart services
  stop, down  Stop services
  scale       Scale services
  rm          Delete services
  pull        Pulls images for services
  upgrade     Perform rolling upgrade between services
  help        Shows a list of commands or help for one command

Run 'rancher-compose COMMAND --help' for more information on a command.
```

### 3.1. Rancher Compose 命令

#### 提示

Rancher Compose 目前不支持 v3 版的 Docker Compose

## 为 RANCHER COMPOSE 设置 RANCHER SERVER

```
# Set the url that Rancher is on
$ export RANCHER_URL=http://server_ip/
# Set the access key, i.e. username
$ export RANCHER_ACCESS_KEY=<username_of_environment_api_key>
# Set the secret key, i.e. password
$ export RANCHER_SECRET_KEY=<password_of_environment_api_key>
```

如果你不想设置环境变量，那么你需要在Rancher Compose 命令中手动送入这些变量:

```
$ rancher-compose --url http://server_ip --access-key <username_of_environment_api_key>
--secret-key <password_of_environment_api_key> up
```

Rancher Compose 支持所有 Docker Compose 支持的命令

Name	Description
create	创建所有服务但不启动
up	启动所有服务
start	启动服务
logs	输出服务日志
restart	重启服务
stop, down	停止服务
scale	缩放服务
rm	删除服务
pull	拉取所有服务的镜像
upgrade	服务之间进行滚动升级
help, h	输出命令列表或者指定命令的帮助列表

## RANCHER COMPOSE 选项

无论何时你使用 Rancher Compose 命令，这些不同的选项你都可以使用

Name	Description
--verbose, --debug	
--file, -f [-file option -file option]	指定一个compose 文件 (默认: docker-compose.yml)
[\$COMPOSE_FILE]	
--project-name, -p	指定一个项目名称 (默认: directory name)
--url	执行 Rancher API接口 URL [\$RANCHER_URL]
--access-key	指定 Rancher API access key [\$RANCHER_ACCESS_KEY]
--secret-key	指定 Rancher API secret key [\$RANCHER_SECRET_KEY]
--rancher-file, -r	指定一个 Rancher Compose 文件 (默认: rancher-compose.yml)
--env-file, -e	指定一个环境变量配置文件
--help, -h	输出帮助文本
--version, -v	输出 Rancher Compose 版本

---

### 3.2. 操作演示

API



准备 docker-compose.yml 文件

```
rancher-compose --url https://rancher.netkiller.cn/v3 --access-key token-pk9n2 --secret-key p2twn42xps9nmh74qm5k5fhfn8rxqhlwv7q9hzcvbvqk5tsqwdh4tc up
```

## 4. Rancher CLI

### 帮助信息

```
[root@localhost ~]# rancher
Rancher CLI, managing containers one UTF-8 character at a time

Usage: rancher [OPTIONS] COMMAND [arg...]

Version: v2.4.13

Options:
  --debug                  Debug logging
  --config value, -c value Path to rancher config (default:
"/root/.rancher") [$RANCHER_CONFIG_DIR]
  --help, -h                show help
  --version, -v              print the version

Commands:
  apps, [app]               Operations with
apps. Uses helm. Flags prepended with "helm" can also be accurately
described by helm documentation.
  catalog                   Operations with
catalogs
  clusters, [cluster]       Operations on
clusters
  context                   Operations for the
context
  globaldns                Operations on global
DNS providers and entries
  inspect                  View details of
resources
  kubectl                  Run kubectl commands
  login, [l]                Login to a Rancher
server
  multicloudapps, [multicloudapp mcapps mcapp] Operations with
multi-cloud apps
  namespaces, [namespace]   Operations on
namespaces
  nodes, [node]              Operations on nodes
  projects, [project]       Operations on
projects
  ps                        Show workloads in a
project
  server                    Operations for the
server
  settings, [setting]      Show settings for
```

```
the current server
ssh                                         SSH into a node
up
wait
cluster, app, project, multiClusterApp
token                                         apply compose config
generate new kubeconfig token
help, [h]                                         Wait for resources
commands or help for one command
Shows a list of

Run 'rancher COMMAND --help' for more information on a command.
```

## 4.1. 登陆 Rancher

链接到 Rancher

```
$ rancher login https://<SERVER_URL> --token <BEARER_TOKEN>
```

登陆演示

```
[root@localhost ~]# rancher login https://192.168.30.13 --token token-5q6kw:8b7w2hj85z7cwkwhhvjlpc2rw5ls5n8d4gj7vj74jbdch9gv4dzq9km
The authenticity of server 'https://192.168.30.13' can't be established.
Cert chain is : [Certificate:
  Data:
    Version: 3 (0x2)
    Serial Number: 5708461865883058034 (0x4f3887d281d2bf72)
  Signature Algorithm: ECDSA-SHA256
  Issuer: O=dynamiclistener-org,CN=dynamiclistener-ca
  Validity
    Not Before: Nov 29 07:00:54 2021 UTC
    Not After : Nov 29 08:53:00 2022 UTC
  Subject: O=dynamic,CN=dynamic
  Subject Public Key Info:
    Public Key Algorithm: ECDSA
    Public-Key: (256 bit)
    X:
      1c:f4:1d:86:32:a7:57:6c:d5:6c:59:86:18:b9:9f:
      40:10:e2:f2:99:96:04:96:10:d4:88:82:2c:06:5c:
      e7:7c
    Y:
```

```

        16:86:d8:41:0a:f3:c3:f0:e7:0c:29:a4:69:e0:b2:
        41:34:73:a6:78:58:e0:a0:df:84:4d:c9:9e:83:3f:
        bd:fd
    Curve: P-256
X509v3 extensions:
    X509v3 Key Usage: critical
        Digital Signature, Key Encipherment
    X509v3 Extended Key Usage:
        TLS Web Server Authentication
    X509v3 Authority Key Identifier:

keyid:3D:40:3F:96:30:78:9F:C1:84:1F:94:E0:A2:4D:1C:E1:69:3D:F3:E4
    X509v3 Subject Alternative Name:
        DNS:localhost, DNS:rancher.cattle-system
        IP Address:127.0.0.1, IP Address:172.19.0.3, IP
Address:192.168.30.13

    Signature Algorithm: ECDSA-SHA256
        30:45:02:21:00:e5:f1:e7:2d:14:fc:25:1f:5c:ea:ce:9a:8d:
        7a:95:e2:d8:bc:64:7a:38:83:3e:84:bc:2e:c7:83:5c:44:5f:
        21:02:20:7c:91:46:fe:2f:bc:f9:18:41:e7:8d:70:0b:1b:c7:
        e3:c2:b3:12:c5:4f:44:ef:fa:00:15:88:6c:3a:c2:e1:23
]

Do you want to continue connecting (yes/no)? yes
INFO[0002] Saving config to /root/.rancher/cli2.json

```

## 配置文件

```

[root@localhost ~]# cat /root/.rancher/cli2.json | jq
{
  "Servers": {
    "rancherDefault": {
      "accessKey": "token-5q6kw",
      "secretKey": "8b7w2hj85z7ckwhhvjl1p2rw5ls5n8d4gj7vj74jbdch9gv4dzq9km",
      "tokenKey": "token-5q6kw:8b7w2hj85z7ckwhhvjl1p2rw5ls5n8d4gj7vj74jbdch9gv4dzq9km",
      "url": "https://192.168.30.13",
      "project": "local:p-8rzzk",
      "cacert": "-----BEGIN CERTIFICATE-----\nMIIBpzCCAU2gAwIBAgIBADAKBggqhkJOPQQDAjA7MRwwGgYDVQQKExNkeW5hbWlj\\nbGlz\ndGVuZXItb3JnMRswGQYDVQQDExJkeW5hbWljbGlzdGVuZXItY2EwHhcNMjEx\\nMTI5MDcwMDU0WhcNMzExMTI3MDcwMDU0WjA7MRwwGgYDVQQKExNkeW5hbWljbGlz\\ndGVuZXItb3JnMRswGQYDVQQDExJkeW5hbWljbGlzdGVuZXItY2EwWTATBgcqhkJOPQIBBggqhkJOPQMBBwNCAA\nRppCv2i2N7k6tF4DWBaJAHhOdwC1SMfymJaj8LUwOP\\nfGsMhpLV1I/6Go7FIRPAIkGxoPqc0CeayxrcGun0R66Ao0IwQDAOBgNVHQ8BAf8E\\nBAMCAqQwDwYDVR0TAQH/BAUwAwEB/zAdBg\nNVHQ4EFgQUPUA/1jb4n8GEH5Tgok0c\\n4Wk98+QwCgYIKoZIzj0EAwIDSAAwRQIhAJn4aRTO"
    }
  }
}

```

```
GsJCaQ11CXzDw/v13o3AmY0a\nqTSMjPRo91vMAiBTnYJMP92NZUoqVV6tG8H+PdsTK/QeTS
Hm1m4iju1JBg==\n-----END CERTIFICATE-----",
    "kubeCredentials": null,
    "kubeConfigs": null
}
},
"CurrentServer": "rancherDefault"
}
```

## 4.2. 查看集群

```
[root@localhost ~]# rancher clusters
CURRENT   ID          STATE      NAME        PROVIDER     NODES     CPU
RAM           PODS
*           local       active     local       Unknown      1         0.10/4
0.07/7.51 GB  5/110
```

## 4.3. 查看节点

```
[root@localhost ~]# rancher nodes
ID          NAME      STATE      POOL      DESCRIPTION
local:machine-5p4pj  local-node  active
```

## 4.4. catalog

```
[root@localhost ~]# rancher catalog
ID          NAME      URL
BRANCH      KIND
helm        helm      https://kubernetes-charts.storage.googleapis.com/
master      helm
library     library   https://git.rancher.io/charts
master      helm
```

## 4.5. 查看设置

```
[root@localhost ~]# rancher settings
ID           NAME          VALUE
agent-image   agent-image   rancher/rancher-agent:v2.1.6
api-ui-version api-ui-version 1.1.6
cacerts       cacerts      -----BEGIN CERTIFICATE-----
MIIC7jCCAdagAwIBAgIBADANBgkqhkiG9w0BAQsFADAoMRIwEAYDVQQKEw10aGUT
cmFuY2gxEjAQBgNVBAMTCWNhdHRSZS1jYTAeFw0xOTAzMTkwODUxNTNaFw0yOTAz
MTYwODUxNTNaMCgxEjAQBgNVBAoTCXRozS1yYW5jaDESMBAGA1UEAxMJY2F0dGx1
LWNhMIIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEA2j/x0F+VpdPHv6ce
zKYAcGeGDjHfv8YL4Q6Np04m6N3z3WwC9e9qNq062TGWml3q3xIu0l1229vTXYZG
YaW7hdIYdNcgE4d2DSFiM0rV2CCiBheAidcvGWTmVuRqDaH7+ofxUez940osjcY
GKYkugUnPA9n6cXRF8KF9a6d6t2Kcwqyd3A5c51d+1Psu2u61bJhJArD GWmi8Iiq
CpkgmPyabCJhpF/YRtLfZ6+mQ0SpcapAuVvXiSGyHjnXykxywthSnThgSJp48SV7
XCYJx5skU4rqKOWRgwgQLWnLdv6kWLTH7EE+aiBwt2lygZUR3Ekpr3rXe7Q+dHh
ygOYVwIDAQABoyMwITAObgNVHQ8BAf8EBAMCAqQwDwYDVR0TAQH/BAUwAwEB/zAN
BgkqhkiG9w0BAQsFAAOCAQEAMfDWlobAEGKvhLW380JA93Icaf bQGgTLyhBglqwF
B4SBj56ZTk i2mZrccUZXYKzIPTRwY39cnBakjkkczm4Hkci3Ag+4hz9g5mJWAa/H
mYrxNEDUJNiih7RNwBne0MaLSHH1MjBfmCSExCJkqlXuD4XXY7dJ05ZQ6urWB2ZI
lC7oqwGUxnvDSEMOnHLTNQy+5yA+jSae9holJ5kp vEq6vE9A1PoUg4/leHZXsI5L
h+gDJX+WbAn5rdyDB0F4XJxn/g1QPGxFNib8EUGt4b58re4x9A8ZaVbzL+KEKrS1
7QO13ju95Cy5+FA5GKO3YILrkvCFI oEaRe83jlbiQZSSaw==
-----END CERTIFICATE-----
cli-url-darwin        cli-url-darwin
https://releases.rancher.com/cli2/v2.0.6/rancher-darwin-amd64-
v2.0.6.tar.gz
cli-url-linux         cli-url-linux
https://releases.rancher.com/cli2/v2.0.6/rancher-linux-amd64-
v2.0.6.tar.gz
cli-url-windows       cli-url-windows
https://releases.rancher.com/cli2/v2.0.6/rancher-windows-386-v2.0.6.zip
engine-install-url    engine-install-url
https://releases.rancher.com/install-docker/17.03.sh
engine-iso-url        engine-iso-url
https://releases.rancher.com/os/latest/rancheros-vmware.iso
engine-newest-version engine-newest-version  v17.12.0
engine-supported-range engine-supported-range ~v1.11.2 || ~v1.12.0
|| ~v1.13.0 || ~v17.03.0
first-login            first-login      false
helm-version           helm-version     v2.10.0-rancher5
ingress-ip-domain     ingress-ip-domain xip.io
install-uuid            install-uuid     6002fd6a-f4ae-454b-
a17b-f90c64aa fa2a
k8s-version            k8s-version      v1.11.6-rancher1-1
k8s-version-to-images k8s-version-to-images {"v1.10.12-rancher1-
1":null,"v1.11.6-rancher1-1":null,"v1.12.4-rancher1-1":null,"v1.9.7-
rancher2-2":null}
machine-version        machine-version  v0.15.0-rancher1-1
namespace              namespace
peer-service            peer-service
```

```

rdns-base-url          rdns-base-url
https://api.lb.rancher.cloud/v1
rke-version            rke-version           v0.1.15
server-image            server-image          rancher/rancher
server-url              server-url
https://192.168.0.157
server-version          server-version         v2.1.6
system-default-registry system-default-registry
system-namespaces       system-namespaces      kube-system,kube-
public,cattle-system,cattle-alerting,cattle-logging,cattle-
pipeline,ingress-nginx
telemetry-opt           telemetry-opt        in
telemetry-uid          telemetry-uid        bf1dd7d1-e0ed-475e-
9dfe-e9af2d71f9b3
ui-feedback-form        ui-feedback-form
ui-index                ui-index
https://releases.rancher.com/ui/latest2/index.html
ui-path                 ui-path
/usr/share/rancher/ui
ui-pl                  ui-pl
whitelist-domain        whitelist-domain      rancher
forums.rancher.com
windows-agent-image     windows-agent-image    rancher/rancher-
agent:v2.1.6-nanoserver-1803

```

## 4.6. rancher kubectl

```

[root@localhost ~]# rancher kubectl get pods --all-namespaces
NAMESPACE          NAME                           READY
STATUS    RESTARTS   AGE
cattle-fleet-local-system fleet-agent-59b74595c-xgnjg   1/1
Running   5          129m
cattle-fleet-system   fleet-controller-66cc4c6b5b-xswdl  1/1
Running   5          131m
cattle-fleet-system   gitjob-5778966b7c-jqdtj   1/1
Running   5          131m
cattle-system        rancher-webhook-6979fb4bf-gs8vk  1/1
Running   5          129m
kube-system          coredns-7448499f4d-4n2vt   1/1
Running   5          134m

```

## 5. K3s

autok3s/k3s/k3d 三种封装，安装最简单的是 autok3s，其次是 k3d，如果喜欢蒸腾就安装原生 k3s。

### 5.1. AutoK3s

<https://github.com/cnrascher/autok3s>

挂载 iptables 内核模块，否则 traefik slb 和 service 起不来

```
modprobe ip_tables
```

```
cat > /etc/modules-load.d/k3s.conf <<-EOF
ip_tables
ip_conntrack
br_netfilter
EOF
```

设置主机名

```
hostnamectl set-hostname master
```

安装 AutoK3s

```
docker run -itd --name=autok3s --restart=unless-stopped --net=host -v
/var/run/docker.sock:/var/run/docker.sock cnrascher/autok3s:v0.5.2
```

安装 AutoK3s 命令行

```
curl -sS https://rancher-mirror.oss-cn-beijing.aliyuncs.com/autok3s/install.sh | 
INSTALL_AUTOK3S_MIRROR=cn sh
```

首次运行

```
[root@master ~]# autok3s
? This is the very first time using autok3s,
would you like to share metrics with us?
You can always your mind with telemetry command Yes

Usage:
  autok3s [flags]
  autok3s [command]

Available Commands:
  completion  Generate completion script
  create      Create a K3s cluster
  delete      Delete a K3s cluster
  describe    Show details of a specific resource
  explorer    Enable kube-explorer for K3s cluster
  help        Help about any command
  join        Join one or more K3s node(s) to an existing cluster
  kubectl     Kubectl controls the Kubernetes cluster manager
  list        Display all K3s clusters
  serve       Run as daemon and serve HTTP/HTTPS request
  ssh         Connect to a K3s node through SSH
  telemetry   Telemetry status for autok3s
  upgrade     Upgrade a K3s cluster to specified version
  version     Display autok3s version

Flags:
  -d, --debug                Enable log debug level
  -h, --help                  help for autok3s
      --log-flush-frequency duration  Maximum number of seconds between log flushes
                                         (default 5s)

Global Environments:
  AUTOK3S_CONFIG  Path to the cfg file to use for CLI requests (default ~/.autok3s)
  AUTOK3S_RETRY    The number of retries waiting for the desired state (default 20)

Use "autok3s [command] --help" for more information about a command.
```

如果你想卸载它

```
Creating uninstall script /usr/local/bin/autok3s-uninstall.sh
kubectl --kubeconfig /etc/rancher/k3s/k3s.yaml get pods --all-namespaces
```

## 命令行创建集群

## 创建 k3d 集群

```
autok3s create --provider k3d --master 1 --name test --worker 1 --api-port 0.0.0.0:6443  
--image rancher/k3s:v1.21.7-k3s1
```

## 私有镜像库

### 指定私有镜像库

```
autok3s create --provider k3d --master 1 --name test --worker 1 --api-port  
0.0.0.0:6443 --image rancher/k3s:v1.21.7-k3s1 --registry https://registry.netkiller.cn
```

<https://rancher.com/docs/k3s/latest/en/installation/private-registry/>

## 暴漏 80/443

### 给宿主主机暴漏 ingress 80/443 端口

```
autok3s create --provider k3d --master 1 --name test --token  
0ab46344f7f62488f771f1332feeabf6 --worker 1 --k3s-install-script https://get.k3s.io --  
api-port 172.18.200.5:6443 --image rancher/k3s:v1.21.7-k3s1 --ports '80:80@loadbalancer'  
--ports '443:443@loadbalancer'
```

## 验证集群是否工作正常

```
l  
kubectl create service clusterip nginx --tcp=80:80  
  
cat <<EOF | kubectl apply -f -  
apiVersion: networking.k8s.io/v1  
kind: Ingress  
metadata:  
  name: nginx  
  annotations:  
    ingress.kubernetes.io/ssl-redirect: "false"  
spec:  
  rules:  
  - http:  
    paths:  
    - path: /  
      pathType: Prefix  
      backend:  
        service:  
          name: nginx
```

```
port:  
    number: 80  
EOF
```

默认 ingress 地址是 br 网桥的

```
[root@master ~]# ip addr | grep br-  
4: br-2ad0dd2291af: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP  
group default  
    inet 172.19.0.1/16 brd 172.19.255.255 scope global br-2ad0dd2291af
```

```
# Run kubectl commands inside here  
# e.g. kubectl get all  
> kubectl get ingress  
NAME      CLASS      HOSTS      ADDRESS          PORTS      AGE  
nginx    <none>    *        172.19.0.2,172.19.0.3   80        4m18s
```

我们已经将 80/443 暴漏给了宿主主机，所以可以直接用宿主主机IP访问 kubernetes 集群

```
[root@master ~]# curl http://localhost  
<!DOCTYPE html>  
<html>  
<head>  
<title>Welcome to nginx!</title>  
<style>  
html { color-scheme: light dark; }  
body { width: 35em; margin: 0 auto;  
font-family: Tahoma, Verdana, Arial, sans-serif; }  
</style>  
</head>  
<body>  
<h1>Welcome to nginx!</h1>  
<p>If you see this page, the nginx web server is successfully installed and  
working. Further configuration is required.</p>  
  
<p>For online documentation and support please refer to  
<a href="http://nginx.org/">nginx.org</a>. <br/>  
Commercial support is available at  
<a href="http://nginx.com/">nginx.com</a>.</p>  
  
<p><em>Thank you for using nginx.</em></p>  
</body>  
</html>
```

扩展本地存储

服务器是OS安装在一块256G的SSD上，默认本地存储路径是/var/lib/rancher/k3s/storage，我们需要扩展本地存储的空间容量，有两个方案：

将1TB硬盘挂载到/var/lib/rancher/k3s/storage，另一种方案，由于1TB硬盘已经在使用，并且挂载到了/opt目录，这时我们使用--volumes '/opt/kubernetes:/var/lib/rancher/k3s/storage' 将 /var/lib/rancher/k3s/storage 挂载到 /opt/kubernetes 目录。

```
autok3s create --provider k3d --master 1 --name dev --token  
7fc4b9a088a3c02ed9f3285359f1d322 --worker 1 --k3s-install-script https://get.k3s.io --  
api-port 0.0.0.0:26080 --image rancher/k3s:v1.21.7-k3s1 --volumes  
'/opt/kubernetes:/var/lib/rancher/k3s/storage'
```

配置节点路径映射，修改 local-path-config

```
config.json: |-  
  {  
    "nodePathMap": [  
      {  
        "node": "DEFAULT_PATH_FOR_NON_LISTED_NODES",  
        "paths": ["/opt/local-path-provisioner"]  
      },  
      {  
        "node": "yasker-lp-dev1",  
        "paths": ["/opt/local-path-provisioner", "/data1"]  
      },  
      {  
        "node": "yasker-lp-dev3",  
        "paths": []  
      }  
    ]  
  }
```

Agent 代理安装

```
hostnamectl set-hostname node1
```

查看 Master Token

```
[docker@master ~]$ docker ps | egrep "k3d.*server" | grep -v lb  
12b9c210b858  rancher/k3s:v1.21.7-k3s1  "/bin/k3d-entrypoint..."  2 days ago  
Up 2 days      k3d-test-server-0  
  
[docker@master ~]$ docker exec -it k3d-test-server-0 cat  
/var/lib/rancher/k3s/server/node-token  
K1083de74aba3f4fe80d744ab2a506d037165f4c475d0ca3636d48a371aac6ef0ac::server:0ab46344f7f6
```

```
2488f771f1332feeabf6
```

### 在节点服务器安装代理

```
SERVER=172.18.200.5
TOKEN=K1083de74aba3f4fe80d744ab2a506d037165f4c475d0ca3636d48a371aac6ef0ac::server:0ab463
44f7f62488f771f1332feeabf6
curl -sfL https://rancher-mirror.oss-cn-beijing.aliyuncs.com/k3s/k3s-install.sh |
INSTALL_K3S_MIRROR=cn K3S_URL=https://${SERVER}:6443 K3S_TOKEN=${TOKEN} sh -
systemctl enable k3s-agent
```

### 加入集群

```
K3S_TOKEN="K104fddbe58cad213694b0346db17ae060fc0974e7cfdbb9063aa1309363de16996::server:0
ab46344f7f62488f771f1332feeabf6"
K3S_URL="https://172.18.200.5:6443"
curl -sfL https://rancher-mirror.oss-cn-beijing.aliyuncs.com/k3s/k3s-install.sh |
INSTALL_K3S_MIRROR=cn K3S_URL=${K3S_URL} K3S_TOKEN=${K3S_TOKEN} sh -s - --docker
```

### 回到 Master 查看节点

```
[root@master ~]# kubectl get node
NAME           STATUS   ROLES      AGE     VERSION
localhost.localdomain   Ready    control-plane,master   28m    v1.24.4+k3s1
node1          Ready    <none>    117s   v1.24.4+k3s1
```

如果此前已经安装了 K3s，需要手工加入 Master

```
k3s agent --server https://10.12.1.40:6443 --token
"K1083de74aba3f4fe80d744ab2a506d037165f4c475d0ca3636d48a371aac6ef0ac::server:0ab46344f7f
62488f771f1332feeabf6"
```

也可以修改环境变量配置文件

```
[root@node1 ~]# cat /etc/systemd/system/k3s-agent.service.env
K3S_TOKEN="K1083de74aba3f4fe80d744ab2a506d037165f4c475d0ca3636d48a371aac6ef0ac::server:0
ab46344f7f62488f771f1332feeabf6"
K3S_URL="https://172.18.200.5:6443"
```

```

> kubectl describe nodes agent-1
Name:           agent-1
Roles:          <none>
Labels:         beta.kubernetes.io/arch=amd64
                beta.kubernetes.io/instance-type=k3s
                beta.kubernetes.io/os=linux
                egress.k3s.io/cluster=true
                kubernetes.io/arch=amd64
                kubernetes.io/hostname=agent-1
                kubernetes.io/os=linux
                node.kubernetes.io/instance-type=k3s
Annotations:    flannel.alpha.coreos.com/backend-data:
{"VNI":1,"VtepMAC":"0e:14:1e:7c:fc:e9"}
                flannel.alpha.coreos.com/backend-type: vxlan
                flannel.alpha.coreos.com/kube-subnet-manager: true
                flannel.alpha.coreos.com/public-ip: 172.18.200.51
                k3s.io/hostname: agent-1
                k3s.io/internal-ip: 172.18.200.51
                k3s.io/node-args: ["agent"]
                k3s.io/node-config-hash:
HJIVMRMG74UTQMXBAZD4NLDPY3FZHN7PYGB7RA7CUGXEDUTUTBTQ=====
                k3s.io/node-env:

{"K3S_DATA_DIR":"/var/lib/rancher/k3s/data/577968fa3d58539cc4265245941b7be688833e6bf5ad7
869fa2afe02f15f1cd2","K3S_TOKEN":"*****","K3S_U...
                node.alpha.kubernetes.io/ttl: 0
                volumes.kubernetes.io/controller-managed-attach-detach: true
CreationTimestamp: Tue, 06 Sep 2022 17:33:21 +0000
Taints:          <none>
Unschedulable:   false
Lease:
    HolderIdentity: agent-1
    AcquireTime:    <unset>
    RenewTime:     Wed, 07 Sep 2022 18:40:08 +0000
Conditions:
    Type        Status  LastHeartbeatTime          LastTransitionTime
Reason            Message
    ----      -----  -----                    -----
    -----
    MemoryPressure  False   Wed, 07 Sep 2022 18:35:57 +0000  Wed, 07 Sep 2022 03:48:43
+0000  KubeletHasSufficientMemory  kubelet has sufficient memory available
    DiskPressure   False   Wed, 07 Sep 2022 18:35:57 +0000  Wed, 07 Sep 2022 03:48:43
+0000  KubeletHasNoDiskPressure  kubelet has no disk pressure
    PIDPressure   False   Wed, 07 Sep 2022 18:35:57 +0000  Wed, 07 Sep 2022 03:48:43
+0000  KubeletHasSufficientPID   kubelet has sufficient PID available
    Ready         True    Wed, 07 Sep 2022 18:35:57 +0000  Wed, 07 Sep 2022 03:48:43
+0000  KubeletReady       kubelet is posting ready status
Addresses:
    InternalIP:  172.18.200.51
    Hostname:    agent-1
Capacity:
    cpu:          16
    ephemeral-storage: 181197372Ki
    hugepages-1Gi: 0
    hugepages-2Mi: 0
    memory:       65237592Ki
    pods:          110
Allocatable:
    cpu:          16
    ephemeral-storage: 176268803344

```

```

hugepages-1Gi:      0
hugepages-2Mi:      0
memory:            65237592Ki
pods:              110
System Info:
Machine ID:        bfc31b708a794f8bad984bd60770ed0f
System UUID:        1514a1f0-c451-11eb-8522-ac3ccdeb3900
Boot ID:           5c0c8375-220a-4abd-8a6d-7debafc6a331
Kernel Version:    5.14.0-70.22.1.el9_0.x86_64
OS Image:          AlmaLinux 9.0 (Emerald Puma)
Operating System:  linux
Architecture:     amd64
Container Runtime Version: containerd://1.6.6-k3s1
Kubelet Version:   v1.24.4+k3s1
Kube-Proxy Version: v1.24.4+k3s1
PodCIDR:          10.42.2.0/24
PodCIDRs:         10.42.2.0/24
ProviderID:        k3s://agent-1
Non-terminated Pods: (11 in total)
  Namespace          Name             CPU Requests  CPU Limits
Memory Requests  Memory Limits  AGE
  -----  -----  -----
  kube-system      svclb-traefik-hhvvv  0 (0%)       0 (0%)       0
(0%)           0 (0%)      25h
  default          nacos-0          0 (0%)       0 (0%)       0
(0%)           0 (0%)      14h
  default          nacos-1          0 (0%)       0 (0%)       0
(0%)           0 (0%)      14h
  default          elasticsearch-data-1  0 (0%)       0 (0%)       0
(0%)           0 (0%)      36m
  default          nginx-565785f75c-gmblp  0 (0%)       0 (0%)       0
(0%)           0 (0%)      35m
  default          nginx-565785f75c-lhhcl  0 (0%)       0 (0%)       0
(0%)           0 (0%)      30m
  default          nginx-565785f75c-rpc4k   0 (0%)       0 (0%)       0
(0%)           0 (0%)      29m
  default          nginx-565785f75c-fr2s7   0 (0%)       0 (0%)       0
(0%)           0 (0%)      29m
  default          nginx-565785f75c-5rjj9   0 (0%)       0 (0%)       0
(0%)           0 (0%)      29m
  default          nginx-565785f75c-2bc9p   0 (0%)       0 (0%)       0
(0%)           0 (0%)      28m
  default          quickstart-es-default-0  100m (0%)   100m (0%)   2Gi
(3%)           2Gi (3%)      10h
Allocated resources:
  (Total limits may be over 100 percent, i.e., overcommitted.)
Resource      Requests  Limits
  -----  -----  -----
cpu           100m (0%)  100m (0%)
memory        2Gi (3%)  2Gi (3%)
ephemeral-storage  0 (0%)  0 (0%)
hugepages-1Gi   0 (0%)  0 (0%)
hugepages-2Mi   0 (0%)  0 (0%)
Events:        <none>

```

## 5.2. 安装 K3s (Docker 模式)

### Server

设置主机名

```
hostnamectl set-hostname master
```

Docker 方式安装

```
curl -sfL https://rancher-mirror.oss-cn-beijing.aliyuncs.com/k3s/k3s-install.sh |  
INSTALL_K3S_MIRROR=cn sh -s - --docker
```

## Agent

设置主机名

```
hostnamectl set-hostname agent-1
```

前往 master 查看 Token

```
[root@master ~]# cat /var/lib/rancher/k3s/server/node-token  
K10b614928142836a5262a802c0d3056f0047f057c895373651b723697a261b128b::server:1d436565a84f  
8e4bdd434b17752a2071
```

在 Agent 节点服务器执行下面命令，加入 master 集群（Docker 方式）

```
K3S_TOKEN="K10b614928142836a5262a802c0d3056f0047f057c895373651b723697a261b128b::server:1  
d436565a84f8e4bdd434b17752a2071"  
K3S_URL="https://172.18.200.5:6443"  
curl -sfL https://rancher-mirror.oss-cn-beijing.aliyuncs.com/k3s/k3s-install.sh |  
INSTALL_K3S_MIRROR=cn K3S_URL=${K3S_URL} K3S_TOKEN=${K3S_TOKEN} sh -s - --docker
```

前往 master 查看节点

```
[root@master ~]# kubectl get node -o wide  
NAME      STATUS    ROLES   AGE     VERSION      INTERNAL-IP      KERNEL-VERSION      CONTAINER-  
EXTERNAL-IP  OS-IMAGE  
RUNTIME  
agent-1   Ready     <none>   2d      v1.24.4+k3s1   172.18.200.51  <none>  
AlmaLinux 9.0 (Emerald Puma)  5.14.0-70.22.1.el9_0.x86_64  docker://20.10.17
```

```
master Ready control-plane, master 2d v1.24.4+k3s1 172.18.200.5 <none>
AlmaLinux 9.0 (Emerald Puma) 5.14.0-70.22.1.el9_0.x86_64 docker://20.10.17
agent-2 NotReady <none> 6s v1.24.4+k3s1 172.18.200.52 <none>
AlmaLinux 9.0 (Emerald Puma) 5.14.0-70.13.1.el9_0.x86_64 docker://20.10.18
```

## 安装 kube-explorer

<https://github.com/cnrancher/kube-explorer>

```
docker rm -f kube-explorer
docker run -itd --name=kube-explorer --restart=unless-stopped --net=host -v
/etc/rancher/k3s/k3s.yaml:/etc/rancher/k3s/k3s.yaml:ro -e
KUBECONFIG=/etc/rancher/k3s/k3s.yaml cnrancher/kube-explorer:latest
```

<https://127.0.0.1:9443/dashboard/>

## 5.3. 安装 K3s (VM 模式)

K3S 的安装方式有多种，官方提供的 k3s-install.sh，还有第三方的 k3d 和 k3sup

### Server 服务安装

设置主机名

```
hostnamectl set-hostname master
```

运行在虚拟机之下

```
curl -sfL https://get.k3s.io | sh -
```

国内镜像

```
curl -sfL http://rancher-mirror.cnrancher.com/k3s/k3s-install.sh | INSTALL_K3S_MIRROR=cn
sh -
systemctl enable k3s
```

查看节点启动状态

```
[root@master ~]# kubectl get node
NAME           STATUS   ROLES      AGE     VERSION
localhost.localdomain   Ready    control-plane, master   28m    v1.24.4+k3s1
```

### 查看节点 Pod 状态

```
kubectl --kubeconfig /etc/rancher/k3s/k3s.yaml get pods --all-namespaces
```

### Agent 代理安装

#### 设置主机名

```
hostnamectl set-hostname node1
```

#### 查看 Master Token

```
[root@master ~]# kubectl get node
NAME           STATUS   ROLES      AGE     VERSION
localhost.localdomain   Ready    control-plane, master   28m    v1.24.4+k3s1

[root@master ~]# cat /var/lib/rancher/k3s/server/node-token
K1000ba39a142b3712d2ffb1459a63f6a7f58b082aeb53406dab15d8cee0f3c2ff0::server:5713047feb08
6388c19663f69cccc966
```

#### 在节点服务器安装代理

```
SERVER=172.18.200.5
TOKEN=K1000ba39a142b3712d2ffb1459a63f6a7f58b082aeb53406dab15d8cee0f3c2ff0::server:571304
7feb086388c19663f69cccc966
curl -sfL https://rancher-mirror.oss-cn-beijing.aliyuncs.com/k3s/k3s-install.sh |
INSTALL_K3S_MIRROR=cn K3S_URL=https://${SERVER}:6443 K3S_TOKEN=${TOKEN} sh -
systemctl enable k3s-agent
```

#### 回到 Master 查看节点

```
[root@master ~]# kubectl get node
NAME           STATUS   ROLES      AGE     VERSION
```

```

localhost.localdomain   Ready    control-plane,master   28m    v1.24.4+k3s1
node1                  Ready    <none>                117s   v1.24.4+k3s1

[root@master ~]# kubectl get nodes -o wide
NAME      STATUS    ROLES          AGE     VERSION   INTERNAL-IP      EXTERNAL-IP
IP        OS-IMAGE
master    Ready     control-plane,master   22h    v1.24.4+k3s1   172.18.200.5   <none>
AlmaLinux 9.0 (Emerald Puma)  5.14.0-70.22.1.el9_0.x86_64   docker://20.10.17
agent-1   Ready     <none>           22h    v1.24.4+k3s1   172.18.200.51  <none>
AlmaLinux 9.0 (Emerald Puma)  5.14.0-70.22.1.el9_0.x86_64   docker://20.10.17

```

## 5.4. k3d

k3d is a lightweight wrapper to run k3s (Rancher Lab's minimal Kubernetes distribution) in docker.

### 安装 k3d

Mac 安装 k3d

```
Neo-iMac:~ neo$ brew install k3d
```

Linux 安装 k3d

```
wget -q -O - https://raw.githubusercontent.com/k3d-io/k3d/main/install.sh | bash
```

```
[root@netkiller ~]# wget -q -O - https://raw.githubusercontent.com/k3d-io/k3d/main/install.sh | bash
Preparing to install k3d into /usr/local/bin
k3d installed into /usr/local/bin/k3d
Run 'k3d --help' to see what you can do with it.
```

### 创建集群

创建并启动集群

```
Neo-iMac:~ neo$ k3d cluster create mycluster
INFO[0000] Prep: Network
INFO[0000] Created network 'k3d-mycluster'
INFO[0000] Created volume 'k3d-mycluster-images'
INFO[0000] Starting new tools node...
INFO[0001] Creating node 'k3d-mycluster-server-0'
INFO[0006] Pulling image 'docker.io/rancher/k3d-tools:5.2.2'
INFO[0006] Pulling image 'docker.io/rancher/k3s:v1.21.7-k3s1'
INFO[0016] Starting Node 'k3d-mycluster-tools'
INFO[0036] Creating LoadBalancer 'k3d-mycluster-serverlb'
INFO[0041] Pulling image 'docker.io/rancher/k3d-proxy:5.2.2'
```

```
INFO[0057] Using the k3d-tools node to gather environment information
INFO[0058] Starting cluster 'mycluster'
INFO[0058] Starting servers...
INFO[0059] Starting Node 'k3d-mycluster-server-0'
INFO[0078] All agents already running.
INFO[0078] Starting helpers...
INFO[0079] Starting Node 'k3d-mycluster-serverlb'
INFO[0087] Injecting '192.168.65.2 host.k3d.internal' into /etc/hosts of all nodes...
INFO[0087] Injecting records for host.k3d.internal and for 2 network members into
CoreDNS configmap...
INFO[0088] Cluster 'mycluster' created successfully!
INFO[0088] You can now use it like this:
kubectl cluster-info
```

映射80端口

```
k3d cluster create mycluster --api-port 127.0.0.1:6445 --servers 3 --agents 2 --port
'80:80@loadbalancer'
```

```
Neo-iMac:~ neo$ k3d cluster create mycluster --api-port 127.0.0.1:6445 --servers 3 --
agents 2 --port '80:80@loadbalancer'
INFO[0000] portmapping '80:80' targets the loadbalancer: defaulting to [servers:*:proxy
agents:*:proxy]
INFO[0000] Prep: Network
INFO[0000] Created network 'k3d-mycluster'
INFO[0000] Created volume 'k3d-mycluster-images'
INFO[0000] Creating initializing server node
INFO[0000] Creating node 'k3d-mycluster-server-0'
INFO[0000] Starting new tools node...
INFO[0001] Starting Node 'k3d-mycluster-tools'
INFO[0002] Creating node 'k3d-mycluster-server-1'
INFO[0003] Creating node 'k3d-mycluster-server-2'
INFO[0004] Creating node 'k3d-mycluster-agent-0'
INFO[0005] Creating node 'k3d-mycluster-agent-1'
INFO[0005] Creating LoadBalancer 'k3d-mycluster-serverlb'
INFO[0005] Using the k3d-tools node to gather environment information
INFO[0007] Starting cluster 'mycluster'
INFO[0007] Starting the initializing server...
INFO[0007] Starting Node 'k3d-mycluster-server-0'
INFO[0012] Starting servers...
INFO[0013] Starting Node 'k3d-mycluster-server-1'
INFO[0045] Starting Node 'k3d-mycluster-server-2'
INFO[0069] Starting agents...
INFO[0070] Starting Node 'k3d-mycluster-agent-1'
INFO[0070] Starting Node 'k3d-mycluster-agent-0'
INFO[0081] Starting helpers...
INFO[0081] Starting Node 'k3d-mycluster-serverlb'
INFO[0089] Injecting '192.168.65.2 host.k3d.internal' into /etc/hosts of all nodes...
INFO[0089] Injecting records for host.k3d.internal and for 6 network members into
CoreDNS configmap...
INFO[0090] Cluster 'mycluster' created successfully!
INFO[0091] You can now use it like this:
kubectl cluster-info
```

除了使用命令，还可以使用 yaml 配置文件创建集群

```
apiVersion: k3d.io/v1alpha2
kind: Simple
name: mycluster
servers: 1
agents: 2
kubeAPI:
  hostPort: "6443" # same as `--api-port '6443'`
ports:
  - port: 8080:80 # same as `--port '8080:80@loadbalancer'`
    nodeFilters:
      - loadbalancer
  - port: 8443:443 # same as `--port '8443:443@loadbalancer'`
    nodeFilters:
      - loadbalancer
```

```
$ k3d cluster create --config /path/to/mycluster.yaml
```

查看信息

```
Neo-iMac:~ neo$ k3d cluster list
NAME      SERVERS   AGENTS   LOADBALANCER
mycluster  3/3       2/2      true
```

查看集群信息

```
Neo-iMac:~ neo$ kubectl cluster-info
Kubernetes control plane is running at https://0.0.0.0:60268
CoreDNS is running at https://0.0.0.0:60268/api/v1/namespaces/kube-system/services/kube-dns:dns/proxy
Metrics-server is running at https://0.0.0.0:60268/api/v1/namespaces/kube-system/services/https:metrics-server:/proxy

To further debug and diagnose cluster problems, use 'kubectl cluster-info dump'.
Neo-iMac:~ neo$
```

查看节点

```
Neo-iMac:~ neo$ kubectl get nodes
NAME           STATUS   ROLES      AGE   VERSION
k3d-mycluster-server-0   Ready    control-plane,master   2m10s   v1.21.7+k3s1
```

## 删除集群

### 删除集群

```
Neo-iMac:~ neo$ k3d cluster delete mycluster
INFO[0000] Deleting cluster 'mycluster'
INFO[0002] Deleting cluster network 'k3d-mycluster'
INFO[0003] Deleting image volume 'k3d-mycluster-images'
INFO[0003] Removing cluster details from default kubeconfig...
INFO[0003] Removing standalone kubeconfig file (if there is one)...
INFO[0003] Successfully deleted cluster mycluster!
```

## 演示

### 部署 nginx

```
kubectl create deployment nginx --image=nginx:alpine
kubectl create service clusterip nginx --tcp=80:80

cat <<EOF | kubectl apply -f -
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: nginx
  annotations:
    ingress.kubernetes.io/ssl-redirect: "false"
spec:
  rules:
  - http:
      paths:
      - path: /
        pathType: Prefix
        backend:
          service:
            name: nginx
            port:
              number: 80
EOF
```

### 操作演示

```
Neo-iMac:~ neo$ kubectl create deployment nginx --image=nginx:alpine
deployment.apps/nginx created
Neo-iMac:~ neo$ kubectl create service clusterip nginx --tcp=80:80
service/nginx created
Neo-iMac:~ neo$ cat <<EOF | kubectl apply -f -
> apiVersion: networking.k8s.io/v1
> kind: Ingress
> metadata:
>   name: nginx
>   annotations:
>     ingress.kubernetes.io/ssl-redirect: "false"
> spec:
>   rules:
>     - http:
>       paths:
>         - path: /
>           pathType: Prefix
>           backend:
>             service:
>               name: nginx
>               port:
>                 number: 80
> EOF
ingress.networking.k8s.io/nginx created
```

使用浏览器或者CURL命令访问 <http://localhost>

```
Neo-iMac:~ neo$ curl http://localhost
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
```

## 配置文件

导出集群配置文件

```

Netkiller-iMac:~ neo$ k3d kubeconfig write mycluster
/Users/neo/.k3d/kubeconfig-mycluster.yaml
Netkiller-iMac:~ neo$ cat /Users/neo/.k3d/kubeconfig-mycluster.yaml
apiVersion: v1
clusters:
- cluster:
  certificate-authority-data:
LS0tLS1CRUdJTiBDRVJUSUZJQ0FURS0tLS0tCk1JSUJkakNDQVIyZ0F3SUJBZ01CQURBS0JnZ3Foa2pPUFFRREFq
QWpNU0V3SHdZRFZRUUREQmhyTTNNdGMyVnkKZG1WeUxXTmhRREUyTkRFME16WTVNelV3SGhjTk1qSXdnVEEyTURJ
ME1qRTFXaGNOTXpJd01UQTBNREkwTwpFMOpXakFqTVNFd0h3WURWUVFEREJock0zTXRjm1z5ZG1WeUxXTmhRREUy
TkRFME16WTVNelV3V1RBVEJnY3Foa2pPC1BRSUJCZ2dxaGtqT1BRTUJCd05DQUFUQVZKN01XdVY3dzA5dGZybUs
bdAybkxOcjFiaGpXM1hIZEgrQUTcdWEKREFBZ3UrNHF4dVdyNHbkbGpraVNrL3ZZMEJjVWJMZ1RkenJnSEY4UnA1
OVpvME13UURBT0JnT1ZIUTHCQWY4RQpCQU1DQXFrd0R3WURWUjBUQVFIL0JBVXdBd0VCL3pBZEJnT1ZIUTRFRmdR
VUZ2UXVRTVBjeStrbTFla2pqaUtUCmRoZ1c4Tjb3Q2dZSutvWk16ajBFQXdJRFJ3QxdSQu1nVGMvZDBHWjN5aWRu
Z2dXamZGwnowc0R6V3diVXkzV0IKVmZyAmZ1Tis3UjRDSUJ4ZmttSUS1Z1NTL0RNUj1tc0VxYUsxZVNGTE12bHzu
NxhaeE53RDJoUlgKLS0tLS1FTkQgQ0VSVE1GSUNBVEutLS0tLQo=
    server: https://127.0.0.1:6445
    name: k3d-mycluster
contexts:
- context:
  cluster: k3d-mycluster
  user: admin@k3d-mycluster
  name: k3d-mycluster
current-context: k3d-mycluster
kind: Config
preferences: {}
users:
- name: admin@k3d-mycluster
  user:
    client-certificate-data:
LS0tLS1CRUdJTiBDRVJUSUZJQ0FURS0tLS0tCk1JSUJrVENDQVRlZ0F3SUJBZ01JVnR3SGsxWD1Uam93Q2dZSUtv
Wk16ajBFQXdJd016RWhNQjhHQTFVRUF3d1kKYXpOekxxTnNhV1Z1ZEMxallVQXhOalf4TkRNmk9UTTFNQjRYRFRJ
eu1ERXdOakF5TkrJee5Wb1hEVE16TURFdwpOakF5TkrJmu0xb3dNREVYTUJVR0ExVUVDaE1PYzNsemRHvnRPbTfo
YzNSbGNuTxhGVEFUQmd0VkJBTvrese41CmzUmxiVHBoWkcxcGjqQlpNQk1Hqn1xR1NNnd1Bz0VHQ0NxR1NNnd1B
d0VIQTBJQUJccFNscmNGMW9VQUCFRW4Kb2hZM1haWmpoMuhkNks0eEtXVUpsc3A2b1R0UzNFbDJJQjZrUmZicGnw
addjQ3NaUnFvV2RsT1Mxd1FtNGM3Vgp1NVZ6aEY2a1NEQkdNQTRHQTfvZer3RUIvd1FFQXdJrm9EQVRCZ05WSFNV
RUREQutCZ2dyQmdFRkJRY0RBkFmCkJnT1ZIu01FR0RBV2dCVFhrTVpDYnJXVTNkQmxib0t2Z0F4MDF6TUJUVEFL
QmdncWhrak9QUVFEQwdOSUFEQkyKQw1FQTFIq0M1OulaS3FieVQ2MExSS2pvcWNWMFJiK3BWZ1FLdU1aR3YzxXfv
OGdDSUZFMjB6OTg1ZStnR3dGYQppK3FkenFYQTVKU2FrV05naVe0TUZLcExpVDI3Ci0tLS0tRU5EIENF1LRJrk1D
QVRFLs0tLS0kLS0tLS1CRUdJTiBDRVJUSUZJQ0FURS0tLS0tCk1JSUJ1RENQVIyZ0F3SUJBZ01CQURBS0JnZ3Fo
a2pPUFFRREFqQWpNU0V3SHdZRFZRUUREQmhyTTNNdFkyeHAKWlc1MExXTmhRREUyTkRFME16WTVNelV3SGhjTk1q
SXdnVEEyTURJME1qRTFXaGNOTXpJd01UQTBNREkwTwpFMOpXakFqTVNFd0h3WURWUVFEREJock0zTXRzmnhWlc1
MExXTmhRREUyTkRFME16WTVNelV3V1RBVEJnY3Foa2pPC1BRSUJCZ2dxaGtqT1BRTUJCd05DQUFTd0c2dk9tay8v
L01jN1UwU3BLZm9ERFM1NDNkQnzsDzVzUn1ZmpmWm0Kt01BQUNrbkViYS9QY0FGc2ZIu1BWWU9HczRnWTQ3TV1D
bzF3L2swv3had31vME13UURBT0JnT1ZIUTHCQWY4RQpCQU1DQXFrd0R3WURWUjBUQVFIL0JBVXdBd0VCL3pBZEJn
T1ZIUTRFRmdRvte1REDrbTyxbE55UVpSNkNyNEFNCmROY3pBVtb3Q2dZSutvWk16ajBFQXdJRFNRQxdSz01oQuTQ
cje3T01DNk94a1hBYnpXUG12R0QwZkptVjFmTnIKVFnzc2IvMktWMjh4QwlFQTFEUv1HU2F0V3R6Y2tFdK1JNnYz
eTcyQ2hwdDZWMHZUDWNEWWJs0WxRVFU9Ci0tLS0tRU5EIENF1RJrk1DQVRFLs0tLS0k
    client-key-data:
LS0tLS1CRUdJTiBFQyBQk1WQVRFIEtFWS0tLS0tCk1IY0NBUVFSUxjTwtaW9mTHo1Z11UZGVrWmlsOEHtzVmz
SXVOnhvHUGU2VXFxRWjkN0dvQW9HQ0NxR1NNndkQXdfSG9VUURRZ0FFR2xKR3R3WFdoUUFBRVNlaUZqZGRsbU9I
VWQzb3JqRXBaUW1XeW5xZE8xTGNTWFlnSHFSRgo4Zwx5bUh0d0t4bEdxaFoyVTVMVz1Dymh6dFY3bFhPRVhnPT0K
LS0tLS1FTkQgRUMgUFJJVkfURSBLRVktLS0tLQo=

```

## 镜像管理

### 导入本地镜像

```
Netkiller-iMac:~ neo$ docker image ls | grep netkiller
netkiller                                         openjdk8
52e22fa28d43    3 weeks ago    552MB
```

将本地 netkiller:openjdk8 镜像导入到 mycluster 中

```
Netkiller-iMac:~ neo$ k3d image import netkiller:openjdk8 -c mycluster
INFO[0000] Importing image(s) into cluster 'mycluster'
INFO[0000] Loading 1 image(s) from runtime into nodes...
INFO[0051] Importing images '[netkiller:openjdk8]' into node 'k3d-mycluster-server-0'...
INFO[0050] Importing images '[netkiller:openjdk8]' into node 'k3d-mycluster-server-2'...
INFO[0050] Importing images '[netkiller:openjdk8]' into node 'k3d-mycluster-agent-1'...
INFO[0050] Importing images '[netkiller:openjdk8]' into node 'k3d-mycluster-server-1'...
INFO[0050] Importing images '[netkiller:openjdk8]' into node 'k3d-mycluster-agent-0'...
INFO[0355] Successfully imported image(s)
INFO[0355] Successfully imported 1 image(s) into 1 cluster(s)
```

## 管理 k3d 集群

```
[root@netkiller k3d]# k3d cluster start mycluster
```

配置 api-port 端口

```
k3d cluster create netkiller --api-port 6443 --servers 1 --agents 1 --port
'80:80@loadbalancer' --port '443:443@loadbalancer'
```

```
[root@netkiller ~]# cat .kube/config | grep server
server: https://0.0.0.0:6445

[root@netkiller ~]# ss -lnt | grep 6445
LISTEN 0          1024          0.0.0.0:6445          0.0.0.0:*
```

```
[root@netkiller ~]# firewall-cmd --add-service=http --permanent
success
[root@netkiller ~]# firewall-cmd --add-service=https --permanent
success
[root@netkiller ~]# firewall-cmd --zone=public --add-service=kube-api --permanent
success
```

```
k3d cluster create netkiller --api-port 172.16.0.1:6443 --servers 1 --agents 1 --port  
'80:80@loadbalancer' --port '443:443@loadbalancer' --k3s-arg "--no-  
deploy=traefik@server:*
```

```
export http_proxy="socks://127.0.0.1:1080" export https_proxy="socks://127.0.0.1:1080"
```

kubectl 管理指定集群

```
export KUBECONFIG=$(k3d kubeconfig write netkiller)"
```

```
[root@netkiller ~]# kubectl config view  
apiVersion: v1  
clusters:  
- cluster:  
    certificate-authority-data: DATA+OMITTED  
    server: https://172.18.200.10:6445  
    name: k3d-netkiller  
contexts:  
- context:  
    cluster: k3d-netkiller  
    user: admin@k3d-netkiller  
    name: k3d-netkiller  
current-context: k3d-netkiller  
kind: Config  
preferences: {}  
users:  
- name: admin@k3d-netkiller  
  user:  
    client-certificate-data: REDACTED  
    client-key-data: REDACTED
```

容器镜像库

```
neo@Netkiller-iMac ~> vim ~/.k3d/registries.yaml  
mirrors:  
  "registry.netkiller.cn":  
    endpoint:  
      - http://registry.netkiller.cn
```

```
neo@Netkiller-iMac ~> k3d cluster create mycluster --api-port 6443 --servers 1 --agents 1 --port '80:80@loadbalancer' --port '443:443@loadbalancer' --registry-config ~/.k3d/registries.yaml
```

## traefik 配置

增加 Redis 6379 端口

```
neo@Netkiller-iMac ~> kubectl edit -n kube-system deployment traefik deployment.apps/traefik edited
```

```
spec:
  containers:
    - args:
        - --global.checknewversion
        - --global.sendanonymoususage
        - --entrypoints.traefik.address=:9000/tcp
        - --entrypoints.web.address=:8000/tcp
        - --entrypoints.websecure.address=:8443/tcp
        - --entrypoints.redis.address=:6379/tcp
        - --entrypoints.mysql.address=:3306/tcp
        - --entrypoints.mongo.address=:27017/tcp
        - --api.dashboard=true
        - --ping=true
        - --providers.kubernetescrd
        - --providers.kubernetesingress
        - --providers.kubernetesingress.ingressendpoint.publishedservice=kube-
      system/traefik
        - --entrypoints.websecure.http.tls=true
    image: rancher/library-traefik:2.4.8
    imagePullPolicy: IfNotPresent
    livenessProbe:
      failureThreshold: 3
      httpGet:
        path: /ping
        port: 9000
        scheme: HTTP
      initialDelaySeconds: 10
      periodSeconds: 10
      successThreshold: 1
      timeoutSeconds: 2
    name: traefik
    ports:
      - containerPort: 9000
        name: traefik
        protocol: TCP
      - containerPort: 8000
        name: web
        protocol: TCP
      - containerPort: 8443
        name: websecure
        protocol: TCP
      - containerPort: 6379
```

```
      name: redis
      protocol: TCP
    - containerPort: 3306
      name: mysql
      protocol: TCP
    - containerPort: 27017
      name: mongo
      protocol: TCP
```

args 处加入

```
- --entrypoints.redis.address=:6379/tcp
```

ports 处加入

```
      - containerPort: 6379
    name: redis
    protocol: TCP
```

```
[root@netkiller k3d]# k3d cluster edit mycluster --port-add '6379:6379@loadbalancer'
```

```
[root@netkiller k3d]# cat redis.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: redis
spec:
  selector:
    matchLabels:
      app: redis
  template:
    metadata:
      labels:
        app: redis
    spec:
      containers:
        - name: redis
          image: redis:latest
          ports:
            - containerPort: 6379
              protocol: TCP
---
apiVersion: v1
kind: Service
metadata:
```

```
    name: redis
  spec:
    ports:
      - port: 6379
        targetPort: 6379
    selector:
      app: redis
---
apiVersion: traefik.containo.us/v1alpha1
kind: IngressRouteTCP
metadata:
  name: redis
spec:
  entryPoints:
    - redis
  routes:
    - match: HostSNI(`*`)
      services:
        - name: redis
          port: 6379
```

```
[root@netkiller k3d]# kubectl apply -f redis.yaml
deployment.apps/redis created
service/redis created
ingressroutetcp.traefik.containo.us/redis created

[root@netkiller k3d]# kubectl get pods
NAME           READY   STATUS    RESTARTS   AGE
redis-5c9986b94b-gsctv   1/1     Running   0          6m49s
[root@netkiller k3d]# kubectl exec redis-5c9986b94b-gsctv -it -- redis-cli
127.0.0.1:6379> set nickname netkiller
OK
127.0.0.1:6379> get nickname
"netkiller"
127.0.0.1:6379>
127.0.0.1:6379> exit
```

```
[root@netkiller k3d]# dnf install redis
[root@netkiller k3d]# redis-cli -h 127.0.0.1
127.0.0.1:6379> get nickname
```

## ingress-nginx

### 卸载 traefik

我们希望使用 nginx ingress，所以需要讲 traefik 卸载

```
kubectl -n kube-system delete helmcharts.helm.cattle.io traefik
```

```
helm uninstall traefik-crd --namespace kube-system
```

安装 ingress-nginx

ingress-nginx: <https://kubernetes.github.io/ingress-nginx/deploy/>

```
kubectl apply -f https://raw.githubusercontent.com/kubernetes/ingress-nginx/controller-v1.3.0/deploy/static/provider/cloud/deploy.yaml
```

修改镜像库地址，否则无法下载

```
wget https://raw.githubusercontent.com/kubernetes/ingress-nginx/controller-v1.3.0/deploy/static/provider/cloud/deploy.yaml
vim deploy.yaml
:%s:registry.k8s.io/ingress-nginx/:registry.cn-
hangzhou.aliyuncs.com/google_containers/:g
:%s:registry.cn-hangzhou.aliyuncs.com/google_containers/controller:registry.cn-
hangzhou.aliyuncs.com/google_containers/nginx-ingress-controller:g
```

svclb-ingress-nginx-controller 启动不起来

```
neo@MacBook-Pro-Neo-3 ~ [1]> kubectl logs -n kube-system svclb-ingress-nginx-controller-8b62cc7d-qbqtv
Defaulted container "lb-tcp-80" out of: lb-tcp-80, lb-tcp-443
+ trap exit TERM INT
+ echo 10.43.36.160
+ grep -Eq :
+ cat /proc/sys/net/ipv4/ip_forward
+ '[' 1 !=' 1 '
+ iptables -t nat -I PREROUTING '!' -s 10.43.36.160/32 -p TCP --dport 80 -j DNAT --to
10.43.36.160:80
iptables v1.8.4 (legacy): can't initialize iptables table `nat': Table does not exist
(do you need to insmod?)
Perhaps iptables or your kernel needs to be upgraded.
```

解决方法

```
root@netkiller ~ # modprobe ip_tables

root@netkiller ~# lsmod|grep iptable
iptable_nat          16384  2
ip_tables            28672  1 iptable_nat
nf_nat               53248  4 xt_nat,nft_chain_nat,iptable_nat,xt_MASQUERADE
```

NAMESPACE	NAME	READY	STATUS
RESTARTS	AGE		
ingress-nginx	ingress-nginx-admission-create-nqv2f	0/1	Completed 0
6m9s			
ingress-nginx	ingress-nginx-admission-patch-m9hcf	0/1	Completed 1
6m9s			
kube-system	metrics-server-7cd5fc6b7-8wrqx	1/1	Running 3
(6m30s ago)	82m		
ingress-nginx	ingress-nginx-controller-75d55647d-nstch	1/1	Running 0
6m9s			
kube-system	coredns-d76bd69b-rgvwj	1/1	Running 3
(6m21s ago)	82m		
kube-system	local-path-provisioner-6c79684f77-psmgs	1/1	Running 3
(6m21s ago)	82m		
kube-system	svclb-ingress-nginx-controller-8b62cc7d-51b8d	2/2	Running 12
(3m17s ago)	6m9s		
kube-system	svclb-ingress-nginx-controller-8b62cc7d-qbqtv	2/2	Running 12
(3m20s ago)	6m9s		

验证安装是否正确

部署 Nginx Web 服务器，用来检查 ingress

```
Neo-iMac:~ neo$ kubectl create deployment nginx --image=nginx:alpine
deployment.apps/nginx created

Neo-iMac:~ neo$ kubectl create service clusterip nginx --tcp=80:80
service/nginx created
```

```
cat <<EOF | kubectl apply -f -
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: nginx
  annotations:
    kubernetes.io/ingress.class: nginx
    ingress.kubernetes.io/ssl-redirect: "false"
spec:
  rules:
  - http:
      paths:
      - path: /
        pathType: Prefix
        backend:
          service:
            name: nginx
            port:
              number: 80
EOF
```

## 5.5. TLS 证书

```
[root@master ~]# ll /var/lib/rancher/k3s/server/tls
total 116
-rw-r--r-- 1 root root 1173 2022-09-08 13:48 client-admin.crt
-rw----- 1 root root 227 2022-09-08 13:48 client-admin.key
-rw-r--r-- 1 root root 1178 2022-09-08 13:48 client-auth-proxy.crt
-rw----- 1 root root 227 2022-09-08 13:48 client-auth-proxy.key
-rw-r--r-- 1 root root 570 2022-09-08 13:48 client-ca.crt
-rw----- 1 root root 227 2022-09-08 13:48 client-ca.key
-rw-r--r-- 1 root root 1165 2022-09-08 13:48 client-controller.crt
-rw----- 1 root root 227 2022-09-08 13:48 client-controller.key
-rw-r--r-- 1 root root 1161 2022-09-08 13:48 client-k3s-cloud-controller.crt
-rw----- 1 root root 227 2022-09-08 13:48 client-k3s-cloud-controller.key
-rw-r--r-- 1 root root 1153 2022-09-08 13:48 client-k3s-controller.crt
-rw----- 1 root root 227 2022-09-08 13:48 client-k3s-controller.key
-rw-r--r-- 1 root root 1181 2022-09-08 13:48 client-kube-apiserver.crt
-rw----- 1 root root 227 2022-09-08 13:48 client-kube-apiserver.key
-rw-r--r-- 1 root root 1149 2022-09-08 13:48 client-kube-proxy.crt
-rw----- 1 root root 227 2022-09-08 13:48 client-kube-proxy.key
-rw----- 1 root root 227 2022-09-08 13:48 client-kubelet.key
-rw-r--r-- 1 root root 1153 2022-09-08 13:48 client-scheduler.crt
-rw----- 1 root root 227 2022-09-08 13:48 client-scheduler.key
-rw-r--r-- 1 root root 3789 2022-09-08 13:48 dynamic-cert.json
drwxr-xr-x 2 root root 4096 2022-09-08 13:48 etcd
-rw-r--r-- 1 root root 591 2022-09-08 13:48 request-header-ca.crt
-rw----- 1 root root 227 2022-09-08 13:48 request-header-ca.key
-rw-r--r-- 1 root root 570 2022-09-08 13:48 server-ca.crt
-rw----- 1 root root 227 2022-09-08 13:48 server-ca.key
-rw----- 1 root root 1675 2022-09-08 13:48 service.key
-rw-r--r-- 1 root root 1368 2022-09-08 13:48 serving-kube-apiserver.crt
-rw----- 1 root root 227 2022-09-08 13:48 serving-kube-apiserver.key
-rw----- 1 root root 227 2022-09-08 13:48 serving-kubelet.key
drwx----- 2 root root 84 2022-09-08 13:48 temporary-certs
```

## 5.6. 创建 Token

```
[root@master ~]# kubectl create serviceaccount secrets
serviceaccount/gitlab created

[root@master ~]# kubectl create token secrets
eyJhbGciOiJSUzI1NiIsImtpZCI6IktCOHRvYlZOLXFPNmEyb1JWdlQxSzBvN0tvZF9HNFBGRnlraDR5UU1jakki
fQ.eyJhdWQiOlsiaHR0cHM6Ly9rdWJlcm5ldGVzLmRlZmF1bHQuc3ZjLmNsdXN0ZXIubG9jYWwiLCJrM3MiXSwiZ
XhwIjoxNjY2MTcycTc4LCJpYXQiOjE2NjYxNjkzNzgsImlzcyI6Imh0dBz0i8va3VizXJuZXRLcy5kZWZhWx0L
nN2Yy5jbHVzdGvYlmvxY2FsIiwi3VizXJuZXRLcy5pbvI6eyJuYW1lc3BhY2UiOijkZWZhWx0Iiwigc2VydmljZ
WFjY291bnQiOnsibmFtZSI6ImdpdGxhYiIsInVpZCI6IjAzNTdkOWIwLWY2YWetNGflMy05MDc0LWM2YzM5Y2Q1Y
TdiNiJ9fSwibmJmIjoxNjY2MTY5Mzc4LCJzdWIiOiJzeXN0ZW06c2VydmljZWfjY291bnQ6ZGVmYXVsdpnaXRsy
WIifQ.oDWjQmVH7BoqHUp4AgjxNncfJ0Nz9oY_js9DU5E-geKmX5GnchC96-
t0ZsdtgPiWXFbieb0auH1wZXCrkFAuGeM-XNDEVfhbK4UL9GiD198KaYMjTSwXipp4bIZeSctL-
Zpc0nSKwaWdWNwxmmmlC30HwMwjQPdwBgCDM8SEr9aepUuJD9rHdclKWv8NcXlLq4t5c9sV3qEQRKbGOTnSeY3Rok
oAY-tYD7FT3jzFktbkTk4SHZAKYUeILLc2eaE0cOm9N4yh18IYZvEcrBGZV_-
N10XzGu5XpDrVVXlk2k2RdYQHj3Iw514sSFfnRVg1Q-1B45y7FJDEbXa-tCXeRKA

[root@master ~]#
token=eyJhbGciOiJSUzI1NiIsImtpZCI6IktCOHRvYlZOLXFPNmEyb1JWdlQxSzBvN0tvZF9HNFBGRnlraDR5UU
```

```
1jakkifQ.eyJhdWQiOlsiaHR0cHM6Ly9rdWJlc51dGVzLmRlZmF1bHQuc3ZjLmNsdXN0ZXIubG9jYWwiLCJrM3M
ixSwiZXhwIjoxNjY2MTcyOTc4LCJpYXQiOjE2NjYxNjkzNzgsImlzcyI6Imh0dHBzOi8va3VizXJuZXRLcy5kZWZ
hdWx0LnN2Yy5jbHVzdGVyLmxvY2FsIiwi3ViZXJuZXRLcy5pbI6eyJuYW11c3BhY2UiOijKZWhdWx0Iiwic2V
ydmljZWfjY291bnQiOnsibmFtZSI6ImdpdGxhYiIsInVpZCI6IjAzNTdkOWIwLWY2YWEtNGFlMy05MDc0LWM2YzM
5Y2Q1YTdiNiJ9fSwibmJmIjoxNjY2MTY5Mzc4LCJzdWIiOjzeXN0ZW06c2VydmIjZWfjY291bnQ6ZGVmYXVsDp
naXRsyWIifQ.oDWjQmVH7BoqHUp4AgjxNncfJ0Nz9oY_js9DU5E-geKmX5GnchC96-
t0ZsdtgPiWXFBieb0auH1wZXCrkFAuGeM-XNDEVfhbK4UL9GiD198KaYMjTSwXipp4bIZeSctL-
Zpc0nSKwaWdWNwxmmmlC30HwMwjQPdwBgCDM8SER9aepUuJD9rHdclKWv8NcX1Lq4t5c9sV3qEQRKbGOTnSeY3Rok
oAY-tYD7FT3jzFktbkTk4SHZAKYUeILLc2eaE0cOm9N4yh18IYZvEcrBGZV_-
N10XzGu5XpDrVVXlk2k2RdyQHj3Iw514sSFFnRVg1Q-1B45y7FJDEbXa-tCXeRKA
[root@master ~]# curl -k https://127.0.0.1:6443/api --header "Authorization: bearer
$token"
{
  "kind": "APIVersions",
  "versions": [
    "v1"
  ],
  "serverAddressByClientCIDRs": [
    {
      "clientCIDR": "0.0.0.0/0",
      "serverAddress": "172.18.200.5:6443"
    }
  ]
}
```

## 5.7. FAQ

### ghcr.io 镜像下载问题

创建集群始终停止在这里，这是因为 ghcr.io 被墙，无法访问。

```
INFO[0004] Pulling image 'ghcr.io/k3d-io/k3d-proxy:5.4.4'
```

找一台境外VPS安装K3D并创建集群，然后讲 k3d-proxy 镜像保存为文件。

```
[docker@netkiller ~]$ docker images
REPOSITORY          TAG      IMAGE ID      CREATED       SIZE
ghcr.io/k3d-io/k3d-proxy   5.4.4   5a963719cb39   2 weeks ago   42.4MB
ghcr.io/k3d-io/k3d-tools   5.4.4   741f01cb5093   2 weeks ago   18.7MB

[docker@netkiller ~]$ docker save 5a963719cb39 -o k3d-proxy.tar
```

复制到国内，导入镜像

```
docker load --input k3d-proxy.tar
```

## k3s 80/443 端口问题

```
[root@master ~]# kubectl get svc --namespace=kube_system
NAME           TYPE      CLUSTER-IP   EXTERNAL-IP   PORT(S)
AGE
kube-dns       ClusterIP  10.43.0.10  <none>
53/UDP,53/TCP,9153/TCP  4d2h
metrics-server  ClusterIP  10.43.88.112 <none>
4d2h
traefik        LoadBalancer 10.43.125.52  172.18.200.5,172.18.200.51
80:32623/TCP,443:31516/TCP  4d2h
```

本地没有 80 和 443 端口

```
[root@master ~]# ss -tnlp | egrep "80|443"
LISTEN 0      1024          *:6443          *:*      users:(("k3s-
server",pid=173779,fd=17))

[root@master ~]# lsof -i :80
[root@master ~]# lsof -i :443
```

telnet 测试后可工作

```
[root@master ~]# telnet 172.18.200.5 80
Trying 172.18.200.5...
Connected to 172.18.200.5.
Escape character is '^]'.
```

80/443 是 Iptable NAT映射出来的端口

```
[root@master ~]# iptables -nL -t nat | grep traefik
# Warning: iptables-legacy tables present, use iptables-legacy to see them
KUBE-MARK-MASQ all -- 0.0.0.0/0      0.0.0.0/0      /* masquerade traffic
for kube-system/traefik:websecure external destinations */
KUBE-MARK-MASQ all -- 0.0.0.0/0      0.0.0.0/0      /* masquerade traffic
for kube-system/traefik:web external destinations */
KUBE-EXT-CVG3OEGEH7H5P3HQ  tcp  -- 0.0.0.0/0      0.0.0.0/0      /* kube-
system/traefik:websecure */ tcp dpt:31516
KUBE-EXT-UQMCRMJZLI3FTLDP  tcp  -- 0.0.0.0/0      0.0.0.0/0      /* kube-
system/traefik:web */ tcp dpt:32623
KUBE-MARK-MASQ all -- 10.42.2.3      0.0.0.0/0      /* kube-
system/traefik:web */
DNAT      tcp  -- 0.0.0.0/0      0.0.0.0/0      /* kube-system/traefik:web
*/ tcp to:10.42.2.3:8000
KUBE-MARK-MASQ all -- 10.42.2.3      0.0.0.0/0      /* kube-
system/traefik:websecure */
```

```

DNAT      tcp  --  0.0.0.0/0          0.0.0.0/0          /* kube-
system/traefik:websecure */ tcp to:10.42.2.3:8443
KUBE-SVC-CVG3OEGEH7H5P3HQ  tcp  --  0.0.0.0/0          10.43.125.52        /* kube-
system/traefik:websecure cluster IP */ tcp dpt:443
KUBE-EXT-CVG3OEGEH7H5P3HQ  tcp  --  0.0.0.0/0          172.18.200.5        /* kube-
system/traefik:websecure loadbalancer IP */ tcp dpt:443
KUBE-EXT-CVG3OEGEH7H5P3HQ  tcp  --  0.0.0.0/0          172.18.200.51        /* kube-
system/traefik:websecure loadbalancer IP */ tcp dpt:443
KUBE-SVC-UQMCRMJZLI3FTLDP  tcp  --  0.0.0.0/0          10.43.125.52        /* kube-
system/traefik:web cluster IP */ tcp dpt:80
KUBE-EXT-UQMCRMJZLI3FTLDP  tcp  --  0.0.0.0/0          172.18.200.5        /* kube-
system/traefik:web loadbalancer IP */ tcp dpt:80
KUBE-EXT-UQMCRMJZLI3FTLDP  tcp  --  0.0.0.0/0          172.18.200.51        /* kube-
system/traefik:web loadbalancer IP */ tcp dpt:80
KUBE-MARK-MASQ  tcp  -- !10.42.0.0/16    10.43.125.52        /* kube-
system/traefik:websecure cluster IP */ tcp dpt:443
KUBE-SEP-NTYW4CRSJDKN6UYK  all  --  0.0.0.0/0          0.0.0.0/0          /* kube-
system/traefik:websecure -> 10.42.2.3:8443 */
KUBE-MARK-MASQ  tcp  -- !10.42.0.0/16    10.43.125.52        /* kube-
system/traefik:web cluster IP */ tcp dpt:80
KUBE-SEP-M4A3OBJNTWBZ5ISS  all  --  0.0.0.0/0          0.0.0.0/0          /* kube-
system/traefik:web -> 10.42.2.3:8000 */

```

NAT 端口可以通过 nmap 扫描出来

```

[root@master ~]# nmap localhost
Starting Nmap 7.91 ( https://nmap.org ) at 2022-09-01 10:04 CST
Nmap scan report for localhost (127.0.0.1)
Host is up (0.0000050s latency).
Other addresses for localhost (not scanned): ::1
Not shown: 996 closed ports
PORT      STATE     SERVICE
22/tcp    open      ssh
80/tcp    filtered http
443/tcp   filtered https
10010/tcp open      rxapi

Nmap done: 1 IP address (1 host up) scanned in 1.26 seconds

```

```

[root@master ~]# iptables-save | grep "CNI-DN" | grep "to-destination"
# Warning: iptables-legacy tables present, use iptables-legacy-save to see them
-A CNI-DN-485265bef43fea7142e9d -p tcp -m tcp --dport 80 -j DNAT --to-destination
10.42.0.10:80
-A CNI-DN-485265bef43fea7142e9d -p tcp -m tcp --dport 443 -j DNAT --to-destination
10.42.0.10:443

```

**flannel 不通**

```
[root@netkiller ~]# systemctl disable firewalld
Removed /etc/systemd/system/multi-user.target.wants/firewalld.service.
Removed /etc/systemd/system/dbus-org.fedoraproject.FirewallD1.service.

[root@master ~]# ifconfig
br-6ac52d42db64: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.20.0.1 netmask 255.255.0.0 broadcast 172.20.255.255
        inet6 fe80::42:94ff:fedf:1fc3 prefixlen 64 scopeid 0x20<link>
            ether 02:42:94:fd:1f:c3 txqueuelen 0 (Ethernet)
            RX packets 782783 bytes 200925233 (191.6 MiB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 625170 bytes 194933933 (185.9 MiB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

cni0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1450
    inet 10.42.0.1 netmask 255.255.255.0 broadcast 10.42.0.255
        inet6 fe80::6448:6dff:fe75:5e8d prefixlen 64 scopeid 0x20<link>
            ether 66:48:6d:75:5e:8d txqueuelen 1000 (Ethernet)
            RX packets 2049669 bytes 371281787 (354.0 MiB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 2235678 bytes 334579428 (319.0 MiB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

docker0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 172.16.0.1 netmask 255.255.255.0 broadcast 172.16.0.255
        inet6 fe80::42:4cff:fe70:883 prefixlen 64 scopeid 0x20<link>
            ether 02:42:4c:70:08:83 txqueuelen 0 (Ethernet)
            RX packets 14 bytes 616 (616.0 B)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 8 bytes 788 (788.0 B)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enp3s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.18.200.5 netmask 255.255.255.0 broadcast 172.18.200.255
        inet6 fe80::2ef0:5dff:fec7:387 prefixlen 64 scopeid 0x20<link>
            ether 2c:f0:5d:c7:03:87 txqueuelen 1000 (Ethernet)
            RX packets 782783 bytes 200925233 (191.6 MiB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 625171 bytes 194934547 (185.9 MiB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

flannel.1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1450
    inet 10.42.0.0 netmask 255.255.255.255 broadcast 0.0.0.0
        inet6 fe80::c051:5cff:fe09:4e18 prefixlen 64 scopeid 0x20<link>
            ether c2:51:5c:09:4e:18 txqueuelen 0 (Ethernet)
            RX packets 180007 bytes 21310049 (20.3 MiB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 222507 bytes 39026179 (37.2 MiB)
            TX errors 0 dropped 5 overruns 0 carrier 0 collisions 0

[root@master ~]# route -n
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref  Use Iface
0.0.0.0         172.18.200.254  0.0.0.0        UG    100    0      0 enp3s0
10.42.0.0        0.0.0.0        255.255.255.0   U     0      0      0 cni0
10.42.1.0        10.42.1.0      255.255.255.0   UG    0      0      0 flannel.1
172.16.0.0        0.0.0.0        255.255.255.0   U     0      0      0 docker0
172.18.200.0      0.0.0.0        255.255.255.0   U     100    0      0 enp3s0
172.20.0.0        0.0.0.0        255.255.0.0     U     0      0      0 br-6ac52d42db64

[root@master ~]# cat /proc/sys/net/ipv4/ip_forward
```

```

1
[root@master ~]# sysctl net.ipv4.ip_forward
net.ipv4.ip_forward = 1

[root@master ~]# kubectl get pods -o wide
NAME                  READY   STATUS    RESTARTS   AGE     IP          NODE
NOMINATED NODE   READINESS GATES
nacos-1            1/1     Running   5 (12h ago)  35h   10.42.0.50  master
<none>           <none>
elasticsearch-data-1 1/1     Running   5 (12h ago)  35h   10.42.0.44  master
<none>           <none>
nacos-2            1/1     Running   7 (6m39s ago) 35h   10.42.1.49  agent-1
<none>           <none>
nacos-0            1/1     Running   7 (6m32s ago) 35h   10.42.1.50  agent-1
<none>           <none>
elasticsearch-master-0 1/1     Running   6 (6m32s ago) 35h   10.42.1.47  agent-1
<none>           <none>
busybox            0/1     Error     0          11h   10.42.1.46  agent-1
<none>           <none>
elasticsearch-data-2 1/1     Running   6 (6m32s ago) 35h   10.42.1.48  agent-1
<none>           <none>
elasticsearch-data-0 1/1     Running   6 (6m32s ago) 35h   10.42.1.51  agent-1
<none>           <none>
[root@master ~]# ping 10.42.0.50
PING 10.42.0.50 (10.42.0.50) 56(84) bytes of data.
64 bytes from 10.42.0.50: icmp_seq=1 ttl=64 time=0.039 ms
64 bytes from 10.42.0.50: icmp_seq=2 ttl=64 time=0.031 ms
64 bytes from 10.42.0.50: icmp_seq=3 ttl=64 time=0.042 ms
64 bytes from 10.42.0.50: icmp_seq=4 ttl=64 time=0.038 ms
^C
--- 10.42.0.50 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3054ms
rtt min/avg/max/mdev = 0.031/0.037/0.042/0.004 ms

[root@master ~]# kubectl get pods -o wide
NAME                  READY   STATUS    RESTARTS   AGE     IP          NODE
NOMINATED NODE   READINESS GATES
nacos-1            1/1     Running   5 (12h ago)  35h   10.42.0.50  master
<none>           <none>
elasticsearch-data-1 1/1     Running   5 (12h ago)  35h   10.42.0.44  master
<none>           <none>
nacos-2            1/1     Running   7 (29m ago)  35h   10.42.1.49  agent-1
<none>           <none>
nacos-0            1/1     Running   7 (29m ago)  35h   10.42.1.50  agent-1
<none>           <none>
elasticsearch-master-0 1/1     Running   6 (29m ago)  35h   10.42.1.47  agent-1
<none>           <none>
busybox            0/1     Error     0          11h   10.42.1.46  agent-1
<none>           <none>
elasticsearch-data-2 1/1     Running   6 (29m ago)  35h   10.42.1.48  agent-1
<none>           <none>
elasticsearch-data-0 1/1     Running   6 (29m ago)  35h   10.42.1.51  agent-1
<none>           <none>
[root@master ~]# ping 10.42.1.51 -c 5
PING 10.42.1.51 (10.42.1.51) 56(84) bytes of data.
64 bytes from 10.42.1.51: icmp_seq=1 ttl=63 time=0.402 ms
64 bytes from 10.42.1.51: icmp_seq=2 ttl=63 time=0.171 ms
64 bytes from 10.42.1.51: icmp_seq=3 ttl=63 time=0.170 ms
64 bytes from 10.42.1.51: icmp_seq=4 ttl=63 time=0.410 ms
64 bytes from 10.42.1.51: icmp_seq=5 ttl=63 time=0.414 ms

--- 10.42.1.51 ping statistics ---

```

```

5 packets transmitted, 5 received, 0% packet loss, time 4105ms
rtt min/avg/max/mdev = 0.170/0.313/0.414/0.116 ms

[root@agent-1 ~]# ping 10.42.0.50 -c 5
PING 10.42.0.50 (10.42.0.50) 56(84) bytes of data.
64 bytes from 10.42.0.50: icmp_seq=1 ttl=63 time=0.154 ms
64 bytes from 10.42.0.50: icmp_seq=2 ttl=63 time=0.206 ms
64 bytes from 10.42.0.50: icmp_seq=3 ttl=63 time=0.213 ms
64 bytes from 10.42.0.50: icmp_seq=4 ttl=63 time=0.218 ms
64 bytes from 10.42.0.50: icmp_seq=5 ttl=63 time=0.220 ms

--- 10.42.0.50 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4125ms
rtt min/avg/max/mdev = 0.154/0.202/0.220/0.024 ms

[root@master ~]# kubectl exec -it nacos-1 -- ping nacos-
0.nacos.default.svc.cluster.local -c 5
PING nacos-0.nacos.default.svc.cluster.local (10.42.1.50) 56(84) bytes of data.
64 bytes from nacos-0.nacos.default.svc.cluster.local (10.42.1.50): icmp_seq=1 ttl=62
time=0.440 ms
64 bytes from nacos-0.nacos.default.svc.cluster.local (10.42.1.50): icmp_seq=2 ttl=62
time=0.429 ms
64 bytes from nacos-0.nacos.default.svc.cluster.local (10.42.1.50): icmp_seq=3 ttl=62
time=0.431 ms
64 bytes from nacos-0.nacos.default.svc.cluster.local (10.42.1.50): icmp_seq=4 ttl=62
time=0.343 ms
64 bytes from nacos-0.nacos.default.svc.cluster.local (10.42.1.50): icmp_seq=5 ttl=62
time=0.229 ms

--- nacos-0.nacos.default.svc.cluster.local ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4127ms
rtt min/avg/max/mdev = 0.229/0.374/0.440/0.082 ms
[root@master ~]# kubectl exec -it nacos-2 -- ping nacos-
0.nacos.default.svc.cluster.local -c 5
PING nacos-0.nacos.default.svc.cluster.local (10.42.1.50) 56(84) bytes of data.
64 bytes from nacos-0.nacos.default.svc.cluster.local (10.42.1.50): icmp_seq=1 ttl=64
time=0.053 ms
64 bytes from nacos-0.nacos.default.svc.cluster.local (10.42.1.50): icmp_seq=2 ttl=64
time=0.039 ms
64 bytes from nacos-0.nacos.default.svc.cluster.local (10.42.1.50): icmp_seq=3 ttl=64
time=0.038 ms
64 bytes from nacos-0.nacos.default.svc.cluster.local (10.42.1.50): icmp_seq=4 ttl=64
time=0.077 ms
64 bytes from nacos-0.nacos.default.svc.cluster.local (10.42.1.50): icmp_seq=5 ttl=64
time=0.039 ms

--- nacos-0.nacos.default.svc.cluster.local ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4113ms
rtt min/avg/max/mdev = 0.038/0.049/0.077/0.015 ms

[root@master ~]# kubectl delete pod busybox
[root@master ~]# kubectl run -i --tty busybox --image=busybox --restart=Never
If you don't see a command prompt, try pressing enter.
/ # ping nacos-0.nacos.default.svc.cluster.local -c 3
PING nacos-0.nacos.default.svc.cluster.local (10.42.1.50): 56 data bytes
64 bytes from 10.42.1.50: seq=0 ttl=64 time=0.052 ms
64 bytes from 10.42.1.50: seq=1 ttl=64 time=0.049 ms
64 bytes from 10.42.1.50: seq=2 ttl=64 time=0.047 ms

--- nacos-0.nacos.default.svc.cluster.local ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.047/0.049/0.052 ms

```

```
/ #
```

### Failed to allocate directory watch: Too many open files

```
[root@netkiller ~]# ulimit -a
real-time non-blocking time  (microseconds, -R) unlimited
core file size          (blocks, -c) 0
data seg size           (kbytes, -d) unlimited
scheduling priority      (-e) 0
file size                (blocks, -f) unlimited
pending signals          (-i) 254690
max locked memory        (kbytes, -l) 64
max memory size          (kbytes, -m) unlimited
open files               (-n) 6553500
pipe size                (512 bytes, -p) 8
POSIX message queues     (bytes, -q) 819200
real-time priority        (-r) 0
stack size               (kbytes, -s) 8192
cpu time                 (seconds, -t) unlimited
max user processes        (-u) 254690
virtual memory            (kbytes, -v) unlimited
file locks               (-x) unlimited
```

```
[root@netkiller ~]# sysctl fs.inotify.max_user_instances fs.inotify.max_user_watches
fs.inotify.max_user_instances = 128
fs.inotify.max_user_watches = 508881

[root@netkiller ~]# sysctl -w fs.inotify.max_user_watches=5088800
fs.inotify.max_user_watches = 5088800

[root@netkiller ~]# sysctl -w fs.inotify.max_user_instances=4096
fs.inotify.max_user_instances = 4096
```

# 6. Rancher Demo

## 6.1. Rancher 部署 Nginx

准备编排脚本

```
[root@localhost ~]# cat nginx.yaml
apiVersion: v1
kind: Service
metadata:
  name: nginx
  labels:
    app: nginx
spec:
  ports:
  - port: 88
    targetPort: 80
  selector:
    app: nginx
  type: NodePort
---
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx
  labels:
    app: nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
  spec:
    containers:
    - name: nginx
      image: nginx:latest
```

```
  ports:
    - containerPort: 80
```

## 部署

```
[root@localhost ~]# rancher kubectl create -f nginx.yaml
service/nginx created
deployment.apps/nginx created
```

## 查看状态

```
[root@localhost ~]# rancher kubectl get deployment -n default
NAME      READY   UP-TO-DATE   AVAILABLE   AGE
nginx     3/3     3           3           113s

[root@localhost ~]# rancher kubectl get service -n default
NAME         TYPE       CLUSTER-IP      EXTERNAL-IP      PORT(S)
AGE
kubernetes   ClusterIP   10.43.0.1      <none>          443/TCP
156m
nginx        NodePort    10.43.111.205  <none>
88:32646/TCP 119s

[root@localhost ~]# rancher kubectl get pods -n default
NAME                           READY   STATUS            RESTARTS
AGE
nginx-585449566-kd2mk        0/1     ContainerCreating   0
14s
nginx-585449566-mdl8n        0/1     ContainerCreating   0
14s
nginx-585449566-v8s5k        0/1     ContainerCreating   0
14s
```

```
[root@localhost ~]# rancher kubectl describe services nginx
Name:           nginx
Namespace:      default
Labels:         app=nginx
Annotations:   field.cattle.io/publicEndpoints:
[{"port":32646,"protocol":"TCP","serviceName":"default:nginx","allNodes":true}]
Selector:       app=nginx
Type:          NodePort
IP Family Policy: SingleStack
IP Families:   IPv4
IP:            10.43.111.205
IPs:           10.43.111.205
Port:          <unset>  88/TCP
TargetPort:    80/TCP
NodePort:      <unset>  32646/TCP
Endpoints:    10.42.0.40:80,10.42.0.41:80,10.42.0.42:80
Session Affinity: None
External Traffic Policy: Cluster
Events:        <none>
```

## 6.2. local-path-provisioner

<https://github.com/rancher/local-path-provisioner>

local-path 即 pod 销毁之后，数据仍然存储在磁盘上，实验过程：

```
kubectl create -f
https://raw.githubusercontent.com/rancher/local-path-provisioner/master/examples/pvc/pvc.yaml
kubectl create -f
https://raw.githubusercontent.com/rancher/local-path-provisioner/master/examples/pod/pod.yaml
```

```
kubectl exec volume-test -- sh -c "echo local-path-test > /data/test"
```

```
kubectl delete -f https://raw.githubusercontent.com/rancher/local-path-provisioner/master/examples/pod/pod.yaml  
kubectl create -f https://raw.githubusercontent.com/rancher/local-path-provisioner/master/examples/pod/pod.yaml
```

```
$ kubectl exec volume-test -- sh -c "cat /data/test"  
local-path-test
```

```
kubectl delete -f https://raw.githubusercontent.com/rancher/local-path-provisioner/master/examples/pod/pod.yaml  
kubectl delete -f https://raw.githubusercontent.com/rancher/local-path-provisioner/master/examples/pvc/pvc.yaml
```

## 7. Longhorn

<https://longhorn.io/docs/>

### 7.1. 安裝 Longhorn

```
[root@master ~]# dnf install -y jq
[root@master ~]# dnf install -y iscsi-initiator-utils

kubectl apply -f
https://raw.githubusercontent.com/longhorn/longhorn/v1.3.1/deploy/longhorn.yaml
```

#### 检查环境

```
[root@master ~]# curl -sSfL
https://raw.githubusercontent.com/longhorn/longhorn/v1.3.1/scripts/environment\_check.sh | bash
[INFO] Required dependencies are installed.
[INFO] Waiting for longhorn-environment-check pods to become
ready (0/3)...
[INFO] All longhorn-environment-check pods are ready (3/3).
[ERROR] nfs-utils is not found in agent-2.
[ERROR] nfs-utils is not found in agent-1.
[ERROR] nfs-utils is not found in master.
[ERROR] Please install missing packages.
[INFO] Cleaning up longhorn-environment-check pods...
[INFO] Cleanup completed.
```

由于我不需要 NFS 所以没有安装 nfs-utils

### 7.2. 选择磁盘类型

首先要给磁盘打上标签，才能使用这个功能

```
[root@master ~]# lsblk
NAME      MAJ:MIN RM    SIZE RO TYPE MOUNTPOINTS
sda        8:0      0 931.5G  0 disk
`-sda1     8:1      0 931.5G  0 part /opt
nvme0n1   259:0    0 238.5G  0 disk
|-nvme0n1p1 259:1  0   600M  0 part /boot/efi
|-nvme0n1p2 259:2  0     1G  0 part /boot
|-nvme0n1p3 259:3  0     64G  0 part [SWAP]
`-nvme0n1p4 259:4  0 172.9G  0 part /
[root@master ~]# ls /opt/longhorn/
longhorn-disk.cfg  replicas
```

/opt/longhorn/ 被打了 HDD 标签

```
allowVolumeExpansion: true
apiVersion: storage.k8s.io/v1
kind: StorageClass
metadata:
  annotations:
    field.cattle.io/description: 硬盘存储
    name: longhorn-storage
parameters:
  diskSelector: hdd
  numberOfReplicas: "3"
  staleReplicaTimeout: "2880"
provisioner: driver.longhorn.io
reclaimPolicy: Delete
volumeBindingMode: Immediate
```

选择多个标签 diskSelector: "ssd,fast"

## 7.3. 节点选择

```
kind: StorageClass
apiVersion: storage.k8s.io/v1
metadata:
  name: longhorn
provisioner: driver.longhorn.io
allowVolumeExpansion: true
parameters:
  numberOfReplicas: "2"
  staleReplicaTimeout: "2880"
  fromBackup: ""
#  diskSelector: "ssd,fast"
#  nodeSelector: "storage,fast"
#  recurringJobs: '[{"name":"snap", "task":"snapshot",
# "cron": "*/* * * * *", "retain":1},
#                   {"name":"backup", "task":"backup",
# "cron": "*/* * * * *", "retain":1,
#                   "labels": {"interval": "2m"}}]'
```

## 7.4. FAQ

### FailedAttachVolume

Type	Reason	Updated	Message
Warning	FailedAttachVolume	8 hours ago	AttachVolume.Attach failed for volume "pvc-03796772-abeb-4042-8e5e-63a9b21da0f7" : rpc error: code = DeadlineExceeded desc = volume pvc-03796772-abeb-4042-8e5e-63a9b21da0f7 failed to attach to node master

## 8. FAQ

### 8.1. 调试 Rancher 查看日志

```
neo@ubuntu:~$ docker logs -f rancher
```

```
$ curl -L http://127.0.0.1:2379/health
{"health": "true"}
```

### 8.2. [network] Host [rancher.netkiller.cn] is not able to connect to the following ports: [rancher.netkiller.cn:2379]. Please check network policies and firewall rules

提示错误

[network] Host [rancher.netkiller.cn] is not able to connect to the following ports: [rancher.netkiller.cn:2379]. Please check network policies and firewall rules

排查

```
$ docker logs -f share-mnt
Error response from daemon: {"message":"No such container: kubelet"}
Error: failed to start containers: kubelet
```

```
neo@m-1d41c853af58:~$ snap list
Name      Version       Rev  Tracking    Publisher   Notes
core      16-2.37.4    6531 stable     canonical✓  core
go        1.12         3318 stable     mwhudson   classic
kubectl   1.13.4       780  stable     canonical✓  classic
lxd       3.11         10343 stable/...  canonical✓  -
microk8s v1.14.0-beta.1 442  1.14/beta canonical✓  classic

neo@m-1d41c853af58:~$ snap remove microk8s kubectl lxd
error: access denied (try with sudo)

neo@m-1d41c853af58:~$ sudo snap remove microk8s kubectl lxd
sudo: unable to resolve host m-1d41c853af58: Invalid argument
microk8s removed
kubectl removed
lxd removed
```

### 8.3. cgroups v2

```
检查操作系统是否支持 cgroups v2
grep cgroup2 /proc/filesystems

启用 cgroups v2 内核参数
systemd.unified_cgroup_hierarchy=1

回到 cgroups v1
sudo grubby --update-kernel=ALL --
args="systemd.unified_cgroup_hierarchy=0"
```

# 第 11 章 netkiller 容器编排工具

## 1. 安裝 netkiller-devops

```
pip3 install netkiller-devops
```

## 2. 使用 python 优雅地编排 Docker 容器

用 Python 替代 docker compose 编排容器

docker compose 是 docker 的容器编排工具，它是基于 YAML 配置，YAML 是一种配置文件格式，支持传递环境变量，但是对于复杂的容器编排显得力不从心。

于是我便开发这个程序，可以像写程序一样编排 docker，可以充分发挥程序员的想象力。

```
pip install netkiller-devops
```

快速入门，首先我们参照这个 docker-compose.yaml 脚本，转换成 python 脚本。

```
version: '3.9'
services:
  nginx:
    container_name: nginx
    environment:
      - TZ=Asia/Shanghai
    extra_hosts:
      - db.netkiller.cn:127.0.0.1
      - cache.netkiller.cn:127.0.0.1
      - api.netkiller.cn:127.0.0.1
    hostname: www.netkiller.cn
    image: nginx:latest
    ports:
      - 80:80
      - 443:443
    restart: always
    volumes:
      - /tmp:/tmp
```

转换成 python 语言之后

```
from netkiller.docker import *

service = Services('nginx')
service.image('nginx:latest')
service.container_name('nginx')
service.restart('always')
service.hostname('www.netkiller.cn')
service.extra_hosts(['db.netkiller.cn:127.0.0.1','cache.netkiller.cn:127.0.0.1','api.netkiller.cn:127.0.0.1'])
service.environment(['TZ=Asia/Shanghai'])
service.ports(['80:80','443:443'])
service.volumes(['/tmp:/tmp'])
# service.debug()
# print(service.dump())

compose = Composes('development')
compose.version('3.9')
compose.services(service)
# print (compose.debug())
print(compose.dump())
compose.save()
```

怎么样，只是换了另一种写法，并没有难度。下面我们就系统学习，如何使用 python 编排 docker 容器

实际上程序最终还是会转化做 docker-compose 脚本执行。这种写法的有点是更灵活，你可以在程序中使用 if, while, 链接数据库，等等操作，可以做更复杂的容器编排。

## 2.1. 安装依赖库

```
neo@MacBook-Pro-Neo ~ % pip install netkiller-devops
```

确认是否安装成功

```
neo@MacBook-Pro-Neo ~ % pip show netkiller-devops
Name: netkiller-devops
Version: 0.2.4
```

```
Summary: DevOps of useful deployment and automation
Home-page: https://github.com/oscm/devops
Author: Neo Chen
Author-email: netkiller@msn.com
License: BSD
Location: /usr/local/lib/python3.9/site-packages
Requires: pyttsx3, requests, redis, pyyaml
Required-by:
```

## 2.2. 创建一个 Services

```
from netkiller.docker import *

service = Services('nginx')
service.image('nginx:latest')
service.container_name('nginx')
service.restart('always')
service.hostname('www.netkiller.cn')
service.extra_hosts(['db.netkiller.cn:127.0.0.1','cache.netkiller.cn:127.0.0.1','api.netkiller.cn:127.0.0.1'])
service.environment(['TZ=Asia/Shanghai'])
service.ports(['80:80','443:443'])
service.volumes(['/tmp:/tmp'])
# service.debug()
print(service.dump())
```

运行结果

```
nginx:
  container_name: nginx
  environment:
  - TZ=Asia/Shanghai
  extra_hosts:
  - db.netkiller.cn:127.0.0.1
  - cache.netkiller.cn:127.0.0.1
  - api.netkiller.cn:127.0.0.1
  hostname: www.netkiller.cn
  image: nginx:latest
  ports:
  - 80:80
  - 443:443
  restart: always
```

```
volumes:  
- /tmp:/tmp
```

来一个复杂的演示

```
for i in range(10) :  
    cluster = Services('nginx-'+str(i))  
    cluster.image('nginx:latest').container_name('nginx-  
'+str(i)).restart('always').hostname('www'+str(i)+'.netkiller.cn')  
    cluster.ports(['8{port}:80'.format(port=i)])  
    print(cluster.dump())
```

运行结果

```
nginx-0:  
  container_name: nginx-0  
  hostname: www0.netkiller.cn  
  image: nginx:latest  
  ports:  
  - 80:80  
  restart: always  
  
nginx-1:  
  container_name: nginx-1  
  hostname: www1.netkiller.cn  
  image: nginx:latest  
  ports:  
  - 81:80  
  restart: always  
  
nginx-2:  
  container_name: nginx-2  
  hostname: www2.netkiller.cn  
  image: nginx:latest  
  ports:  
  - 82:80  
  restart: always  
  
nginx-3:  
  container_name: nginx-3  
  hostname: www3.netkiller.cn  
  image: nginx:latest  
  ports:
```

```
- 83:80
restart: always

nginx-4:
  container_name: nginx-4
  hostname: www4.netkiller.cn
  image: nginx:latest
  ports:
    - 84:80
  restart: always

nginx-5:
  container_name: nginx-5
  hostname: www5.netkiller.cn
  image: nginx:latest
  ports:
    - 85:80
  restart: always

nginx-6:
  container_name: nginx-6
  hostname: www6.netkiller.cn
  image: nginx:latest
  ports:
    - 86:80
  restart: always

nginx-7:
  container_name: nginx-7
  hostname: www7.netkiller.cn
  image: nginx:latest
  ports:
    - 87:80
  restart: always

nginx-8:
  container_name: nginx-8
  hostname: www8.netkiller.cn
  image: nginx:latest
  ports:
    - 88:80
  restart: always

nginx-9:
  container_name: nginx-9
  hostname: www9.netkiller.cn
  image: nginx:latest
  ports:
    - 89:80
  restart: always
```

## 2.3. 创建 Composes

Services 对象创建服务，让服务工作还需要 Composes 对象。

```
from netkiller.docker import *

service = Services('nginx')
service.image('nginx:latest')
service.container_name('nginx')
service.restart('always')
service.hostname('www.netkiller.cn')
service.extra_hosts(['db.netkiller.cn:127.0.0.1','cache.netkiller.cn:127.0.0.1','api.netkiller.cn:127.0.0.1'])
service.environment(['TZ=Asia/Shanghai'])
service.ports(['80:80','443:443'])
service.volumes(['/tmp:/tmp'])

compose = Composes('development')
compose.version('3.9')
compose.services(service)
# print (compose.debug())
print(compose.dump())
compose.save()
# compose.save('/tmp/docker-compose.yaml')
```

运行结果

```
services:
  nginx:
    container_name: nginx
    environment:
      - TZ=Asia/Shanghai
    extra_hosts:
      - db.netkiller.cn:127.0.0.1
      - cache.netkiller.cn:127.0.0.1
      - api.netkiller.cn:127.0.0.1
    hostname: www.netkiller.cn
    image: nginx:latest
    ports:
      - 80:80
      - 443:443
    restart: always
    volumes:
```

```
- /tmp:/tmp
version: '3.9'
```

这已经是一个完善的 docker-compose 脚本了。使用 save 可以保存为 yaml 文件，这是使用 docker-compose -f development.yaml up 就可以启动容器了。

Composes 对象同时也携带了完善的 docker-compose 命令和参数，用于自我管理容器。

compose.up() 创建容器

```
compose = Composes('development')
compose.version('3.9')
compose.services(service)
compose.up()
```

compose.start() 启动已存在的容器

```
compose = Composes('development')
compose.version('3.9')
compose.services(service)
compose.start()
```

compose.stop() 停止已存在的容器

```
compose = Composes('development')
compose.version('3.9')
compose.services(service)
compose.stop()
```

compose.restart() 重启已存在的容器

```
compose = Composes('development')
```

```
compose.version('3.9')
compose.services(service)
compose.restart()
```

compose.rm() 销毁已存在的容器

```
compose = Composes('development')
compose.version('3.9')
compose.services(service)
compose.rm()
```

compose.logs() 查看容器日志

```
compose = Composes('development')
compose.version('3.9')
compose.services(service)
compose.logs()
```

compose.ps() 查看容器运行状态

```
compose = Composes('development')
compose.version('3.9')
compose.services(service)
compose.ps()
```

## 2.4. 容器管理

Docker 对象是让我们摆脱 docker-compose 这个命令，它将接管 docker-compose 这个命令，进行自我管理。

```
#!/usr/bin/python3
#-*- coding: utf-8 -*-
```

```

#####
# Home : http://netkiller.github.io
# Author: Neo <netkiller@msn.com>
# Upgrade: 2021-09-05
#####
try:
    import os, sys
    module =
os.path.dirname(os.path.dirname(os.path.abspath(__file__)))
    sys.path.insert(0,module)
    from netkiller.docker import *
except ImportError as err:
    print("%s" %(err))

nginx = Services('nginx')
nginx.image('nginx:latest')
nginx.container_name('nginx')
nginx.restart('always')
nginx.hostname('www.netkiller.cn')
nginx.environment(['TA=Asia/Shanghai'])
nginx.ports(['80:80'])

compose = Composes('development')
compose.version('3.9')
compose.services(nginx)
compose.workdir('/tmp/compose')

if __name__ == '__main__':
    try:
        docker = Docker()
        docker.environment(compose)
        docker.main()
    except KeyboardInterrupt:
        print ("Crtl+C Pressed. Shutting down.")

```

## 运行结果

```

neo@MacBook-Pro-Neo ~ % python3 docker.py
Usage: docker.py [options] up|rm|start|stop|restart|logs|top|images|exec
<service>

Options:
-h, --help            show this help message and exit
--debug              debug mode
-d, --daemon          run as daemon
--logfile=LOGFILE    logs file.
-l, --list             following logging

```

```
-f, --follow      following logging
-c, --compose    show docker compose
-e, --export     export docker compose

Homepage: http://www.netkiller.cn          Author: Neo <netkiller@msn.com>
```

Docker 对象提供了与 docker-compose 对等的参数，用法也基本相通。例如

```
python3 docker.py up = docker-compose up
python3 docker.py up -d nginx = docker-compose up -d nginx
python3 docker.py restart nginx = docker-compose restart nginx

python3 docker.py ps = docker-compose ps
python3 docker.py logs nginx = docker-compose logs nginx
```

使用 -c 可以查看 compose yaml 脚本，使用 -e 可以导出 docker compose yaml

## 2.5. 演示例子

### Redis 主从配置

#### 例 11.1. Redis Master/Slave

```
from netkiller.docker import *

image = 'redis:latest'
requirepass='11223344'

compose = Composes('redis-master-slave')
compose.version('3.9')

master = Services('master')
master.image(image)
master.container_name('master')
master.restart('always')
master.environment(['TZ=Asia/Shanghai'])
master.ports('6379:6379')
master.volumes(['/tmp/master:/data'])
master.sysctls(['net.core.somaxconn=1024'])
master.command([
    '--requirepass '+requirepass,
```

```

        '--appendonly yes'])
# master.debug()
# print(master.dump())
compose.services(master)

for i in range(5) :
    slave = Services('slave-'+str(i))
    slave.image(image).container_name('slave-'+str(i)).restart('always')

slave.ports(['638{port}:6379'.format(port=i)]).environment(['TZ=Asia/Shanghai'])
    slave.volumes(['/tmp/slave{n}:/data'.format(n=i)])
    slave.sysctls(['net.core.somaxconn=1024']).command([
        '--slaveof master 6379',
        '--masterauth '+requirepass,
        '--requirepass ' + requirepass,
        '--appendonly yes'
    ])

    # print(cluster.dump())
    compose.services(slave)

# print (compose.debug())
print(compose.dump())
# compose.save()
compose.up()

```

## 2.6. 使用 Python 编排 Dockerfile

```

from netkiller.docker import *

# 实例化 Dockerfile() 对象
nginx = Dockerfile()

# 基于什么镜像
nginx.image('nginx:latest')

# 配置挂载卷
nginx.volume(['/etc/nginx','/var/log/nginx','/opt'])

# 运行脚本
nginx.run('apt update -y && apt install -y procps')

# 暴漏端口
nginx.expose(['80','443'])

```

```
# 设置工作目录  
nginx.workdir('/opt')  
  
# 打印 Dockerfile  
nginx.show()
```

## 运行结果

```
FROM nginx:latest  
VOLUME ["/etc/nginx","/var/log/nginx","/opt"]  
RUN apt update -y && apt install -y procps  
EXPOSE 80 443  
WORKDIR /opt
```

## 另一种写法

```
from netkiller.docker import *  
  
nginx = Dockerfile()  
nginx.image('nginx:latest').volume(['/etc/nginx','/var/log/nginx']).run(  
    'apt update -y && apt install -y  
    procps').expose(['80','443']).workdir('/opt')  
nginx.render()  
nginx.save('/tmp/Dockerfile')
```

## 构建 Docker 镜像

```
from netkiller.docker import *  
  
# 编排 Docker 镜像  
dockerfile = Dockerfile()  
dockerfile.image('openjdk:8').volume(['/srv']).run(  
    'apt update -y && apt install -y procps net-tools iputils-ping  
    iproute2 telnet').expose(['80', '443']).workdir('/srv')
```

```

# 通过 Service 设置镜像名称是 netkiller:openjdk8
image = Services('image')
image.build(dockerfile)
image.image('netkiller:openjdk8')

# 构建镜像
demo = Composes('demo')
demo.version('3.9')
demo.services(image)
demo.build()

```

## 完整演示

```

#!/usr/bin/python3
-*- coding: utf-8 -*-
#####
# Home : http://netkiller.github.io
# Author: Neo <netkiller@msn.com>
# Upgrade: 2021-11-17
#####
try:
    import os, sys
    module =
os.path.dirname(os.path.dirname(os.path.abspath(__file__)))
    print(module)
    sys.path.insert(0,module)
    from netkiller.docker import *
except ImportError as err:
    print("%s" %(err))

dockerfile = Dockerfile()
# dockerfile.label({'org.opencontainers.image.authors':'netkiller'})
dockerfile.image('openjdk:8-alpine')
# dockerfile.image('openjdk:8')
dockerfile.env({'ROCKETMQ_VERSION':'4.9.2','ROCKETMQ_HOME':'/srv/rocketmq',
'PATH': '${ROCKETMQ_HOME}/bin:$PATH'} ) # 'JAVA_OPT':'${JAVA_OPT} -server -Xms512m -Xmx2048m -Xmn128m'
dockerfile.arg({'user':'rocketmq', 'group':'nogroup'})
dockerfile.run('wget https://dlcdn.apache.org/rocketmq/4.9.2/rocketmq-all-4.9.2-bin-release.zip && unzip rocketmq-all-4.9.2-bin-release.zip')
dockerfile.run('mv rocketmq-4.9.2 /srv/rocketmq-4.9.2 && rm -rf rocketmq-all-4.9.2-bin-release.zip')
dockerfile.run('ln -s /srv/rocketmq-${ROCKETMQ_VERSION} /srv/rocketmq')
dockerfile.run('adduser -S -D ${user}')
dockerfile.run(['chown ${user}:${group} -R /srv/rocketmq-${ROCKETMQ_VERSION}'])

```

```

dockerfile.expose(['9876'])
dockerfile.expose(['10909','10911','10912'])
dockerfile.copy('docker-entrypoint.sh','/srv/docker-entrypoint.sh')
dockerfile.run('chmod a+x /srv/docker-entrypoint.sh')
dockerfile.entrypoint(['"/srv/docker-entrypoint.sh"]')
dockerfile.workdir('${ROCKETMQ_HOME}')
# dockerfile.render()
# dockerfile.save('/tmp/Dockerfile')

rocketmq = Services('rocketmq')
rocketmq.build(dockerfile).image('registry.netkiller.cn/rocketmq/rocketmq:4.9.2').container_name('rocketmq')
# rocketmq.entrypoint('/srv/rocketmq/bin/mqnamesrv')
# rocketmq.ports('9876:9876').command('/srv/rocketmq/bin/mqnamesrv')

dockerfile = Dockerfile()
dockerfile.image('registry.netkiller.cn/rocketmq/rocketmq:4.9.2')
dockerfile.run('ln -s /srv/rocketmq-${ROCKETMQ_VERSION} /srv/mqnamesrv')
dockerfile.cmd('/srv/mqnamesrv/bin/mqnamesrv')
dockerfile.workdir('/srv/mqnamesrv')
dockerfile.user('rocketmq:nogroup')
dockerfile.volume([
    '/home/rocketmq/logs/rocketmqlogs'
])

mqnamesrv = Services('mqnamesrv')
mqnamesrv.build(dockerfile).image('registry.netkiller.cn/rocketmq/mqnamesrv:4.9.2').container_name('mqnamesrv').ports('9876:9876')
mqnamesrv.command('mqnamesrv')

dockerfile = Dockerfile()
dockerfile.image('registry.netkiller.cn/rocketmq/rocketmq:4.9.2')
dockerfile.run('ln -s /srv/rocketmq-${ROCKETMQ_VERSION} /srv/mqbroker')
dockerfile.cmd('/srv/rocketmq/bin/mqbroker')
dockerfile.workdir('/srv/mqbroker')
dockerfile.user('rocketmq:nogroup')
dockerfile.volume([
    '/home/rocketmq/logs/rocketmqlogs'
])

mqbroker = Services('mqbroker')
mqbroker.build(dockerfile).image('registry.netkiller.cn/rocketmq/mqbroker:4.9.2').container_name('mqbroker').ports(['10909:10909','10911:10911','10912:10912'])
mqbroker.command('mqbroker -n mqnamesrv:9876 -c /srv/rocketmq/conf/broker.conf')
mqbroker.volumes(['/tmp/logs:/home/rocketmq/logs/rocketmqlogs'])

composes = Composes('test')
composes.version('3.9')
composes.services(rocketmq)
composes.services(mqnamesrv)

```

```

composes.services(mqbroker)

# cat >> /srv/docker-entrypoint.sh <<'EOF'
# EOF

entrypoint='#!/bin/sh
if [ "$1" = 'mqnamesrv' ]; then
    exec /srv/rocketmq/bin/mqnamesrv
fi
exec "$@"
'

if __name__ == '__main__':
    try:
        docker =
Docker({'DOCKER_HOST':'ssh://root@192.168.30.11','NAMESRV_ADDR':'localhost:9876'})
        docker.createfile('rocketmq/rocketmq/docker-
entrypoint.sh',entrypoint)
        docker.environment(composes)
        docker.main()
    except KeyboardInterrupt:
        print ("Crtl+C Pressed. Shutting down.")

```

运行

```
python3 demo.py -e test -b rocketmq
```

## 2.7.

```

#!/usr/bin/python3
#-*- coding: utf-8 -*-
#####
# Home : http://netkiller.github.io
# Author: Neo <netkiller@msn.com>
# Upgrade: 2022-08-19
#####
try:
    import os, sys
    from netkiller.docker import *
except ImportError as err:

```

```
        print("%s" %(err))

#extra_hosts = [
#    'mongo.netkiller.cn:172.17.195.17',
#    'eos.netkiller.cn:172.17.15.17',
#    'cfca.netkiller.cn:172.17.15.17'
#]

# 解决时区问题，只能制作新镜像，并且在镜像中增加 tzdata
dockerfile = Dockerfile()
dockerfile.image('openresty/openresty:alpine').run(
    'apk add -U tzdata',
    'cp /usr/share/zoneinfo/Asia/Shanghai /etc/localtime'
)
openresty = Services('openresty')
openresty.build(dockerfile)
openresty.image('openresty:alpine')
openresty.container_name('openresty')
openresty.restart('always')
openresty.hostname('www.netkiller.cn')
#openresty.extra_hosts(extra_hosts)
#
service.extra_hosts(['db.netkiller.cn:127.0.0.1','cache.netkiller.cn:127.0.0.1','api.netkiller.cn:127.0.0.1'])
openresty.environment(['TZ=Asia/Shanghai'])
openresty.ports(['80:80','443:443'])
#openresty.depends_on('test')
openresty.working_dir('/usr/local/openresty')
openresty.volumes(
    [
        '/var/log/openresty:/usr/local/openresty/nginx/logs',
    ]
)

development = Composes('development')
development.workdir('/var/tmp/development')
development.version('3.9')
development.services(openresty)

if __name__ == '__main__':
    try:
        docker = Docker(
            #           {'DOCKER_HOST': 'ssh://root@192.168.30.11'}
        )
        #docker.sysctl({'neo': '1'})
        docker.environment(development)
        docker.main()
    except KeyboardInterrupt:
        print("Crtl+C Pressed. Shutting down.")
```

## 2.8. logstash

```
[root@netkiller log]# cat /srv/logstash/bin/logstash
#!/usr/bin/python3
# -*- coding: utf-8 -*-
#####
# Home : http://netkiller.github.io
# Author: Neo <netkiller@msn.com>
# Upgrade: 2023-01-11
#####
import os
import sys
try:
    module =
os.path.dirname(os.path.dirname(os.path.abspath(__file__)))
    sys.path.insert(0, module)
    from netkiller.docker import *
except ImportError as err:
    print("%s" % (err))

project = 'logstash'

# extra_hosts = [
#     'mongo.netkiller.cn:172.17.195.17', 'eos.netkiller.cn:172.17.15.17',
#     'cfca.netkiller.cn:172.17.15.17'
# ]

dockerfile = Dockerfile()
dockerfile.image('docker.elastic.co/logstash/logstash:8.6.0').run(
    ['apk add -U tzdata', 'rm -f
/usr/share/logstash/pipeline/logstash.conf']
).copy('pipeline/', '/usr/share/logstash/pipeline/').copy('config/',
'/usr/share/logstash/config/').workdir('/usr/share/logstash')

logstash = Services(project)
# openresty.image('openresty/openresty:alpine')
# openresty.build(dockerfile)
logstash.image('docker.elastic.co/logstash/logstash:8.6.0')
logstash.container_name(project)
logstash.restart('always')
# logstash.hostname('www.netkiller.cn')
# openrelogstashsty.extra_hosts(extra_hosts)
logstash.extra_hosts(['elasticsearch:127.0.0.1'])
logstash.environment(['TZ=Asia/Shanghai','XPACK_MONITORING_ENABLED=false',
'LOG_LEVEL=info'])
logstash.ports(['12201:12201/udp', '12201:12201/tcp'])
#logstash.ports(['12201:12201','4567:4567'])
# openresty.depends_on('test')
```

```

logstash.working_dir('/usr/share/logstash')
logstash.user('root')
logstash.volumes(
    [
        '/srv/logstash/pipeline/:/usr/share/logstash/pipeline/',
        #' /srv/logstash/config/logstash.yml:/usr/share/logstash/config/logstash.y
ml:rw',
        '/srv/logstash/logs/:/usr/share/logstash/logs/',
        '/opt/log/:/opt/log/',
        '/proc:/proc','/sys:/sys'
    ]
).privileged()

development = Composes('development')
development.workdir('/var/tmp/development')
development.version('3.9')
development.services(logstash)

if __name__ == '__main__':
    try:
        docker = Docker(
            # {'DOCKER_HOST': 'ssh://root@192.168.30.11'}
        )
        # docker.sysctl({'neo': '1'})
        docker.environment(development)
        docker.main()
    except KeyboardInterrupt:
        print("Crtl+C Pressed. Shutting down.")

```

## pipeline

```

[root@netkiller log]# cat /srv/logstash/pipeline/config.conf
input {
    tcp {
        port => 4567
        codec => json_lines
    }
    gelf {
        port => 12201
        use_udp => true
        use_tcp => true
    }
}

filter {

```

```

    ruby {
        code => "event.set('datetime',
event.get('@timestamp').time.localtime.strftime('%Y-%m-%d %H:%M:%S'))"
    }
}

output {
    if [marker] {
        file {
            path => "/opt/log/%{environment}/%{service}/%
{marker}.%{+yyyy}-%{+MM}-%{+dd}.log"
            codec => line { format => "[#{datetime}] #{level}%
{message}"}
        }
    } else {
        file {
            path => "/opt/log/%{environment}/%
{service}/spring.%{+yyyy}-%{+MM}-%{+dd}.log"
            codec => line { format => "[#{datetime}] [%-
{host}:#{source_host}] [%{level}] (%{class}.%{method}:#{line}) - %
{message}"}
        }
        file {
            path => "/opt/log/%{environment}/%{service}/spring.%-
{+yyyy}-%{+MM}-%{+dd}.json.gz"
            codec => json_lines
            gzip => true
        }
    }
}

if "ERROR" in [level] {
    http {
        url => "https://oapi.dingtalk.com/robot/send?
access_token=f9257740a95b0b052e69c699400ea0ec06ae40fa5db316613f084b0162de
90f8"
        http_method => "post"
        content_type => "application/json; charset=utf-8"
        format => "message"
        message => '{"msgtype":"text","text":'
        {"content":"Logger: #{host}[#{source_host}] - #{message}"})
    }
}
if "WARN" in [level] {
    http {
        url => "https://oapi.dingtalk.com/robot/send?
access_token=d6602c6fbe68d31f791968a12201a6980f36b47250f39a57a117582afca7
678b"
        http_method => "post"
        content_type => "application/json; charset=utf-8"
        format => "message"
        message => '{"msgtype":"text","text":'
        {"content":"Logger: #{host}[#{source_host}] - #{message}"})
    }
}

```

```
        }  
    }
```

### 3. 使用 Python 优雅地编排 Kubernetes

#### 3.1. 快速演示编排Nginx

你还用 yaml 编排 kubernetes 吗？你是否意识到 YAML 的局限性，例如你无法定义变量，不能循环重复内容，不能跟高级语言互动，于是你转向了 HELM， helm 提供模版技术，可以在模版中实现包含引用，定义变量，循环等等操作，但也仅此而已。 YAML 和 HELM 方案更多是给运维人员准备的，对开发并不友好，那么有没有更好的解决方案呢？

我用 python 写的一个工具吧 netkiller-devops，安装方法

```
pip install netkiller-devops
```

下面编排一个 nginx 给大家演示一下。运行环境使用 macOS + k3d

##### 提示

k3s 是由 Rancher Labs 推出的一款轻量级 Kubernetes 发行版，满足在边缘计算环境中运行在 x86、ARM64 处理器上的小型、易于管理的 Kubernetes 集群日益增长的需求。

k3s 除了在边缘计算领域的应用外，在研发侧的表现也十分出色。我们可以快速在本地拉起一个轻量级的 k8s 集群，而 k3d 则是 k3s 社区创建的一个小工具，可以在一个 docker 进程中运行整个 k3s 集群，相比直接使用 k3s 运行在本地，更好管理和部署。

安装 k3d

```
brew install k3d
```

启动集群

```
k3d cluster create mycluster --api-port 6443 --servers 1 --agents 1 --  
port '80:80@loadbalancer' --port '443:443@loadbalancer'
```

现在创建一个 python 文件 例如 nginx.py 把下面内容复制进去

```
import os, sys

module = os.path.dirname(
    os.path.dirname(os.path.dirname(os.path.abspath(__file__))))
print(module)
sys.path.insert(0, module)
from netkiller.kubernetes import *

namespace = Namespace()
namespace.metadata.name('development')
namespace.metadata.namespace('development')
# namespace.debug()

service = Service()
service.metadata().name('nginx')
service.metadata().namespace('development')
service.spec().selector({'app': 'nginx'})
service.spec().type('NodePort')
service.spec().ports([
    {
        'name': 'http',
        'protocol': 'TCP',
        'port': 80,
        'targetPort': 80
    }])
# deployment.debug()

deployment = Deployment()
deployment.apiVersion('apps/v1')
deployment.metadata().name('nginx').labels({'app':
'nginx'}).namespace('development')
deployment.spec().replicas(2)
deployment.spec().selector({'matchLabels': {'app': 'nginx'}})
deployment.spec().template().metadata().labels({'app': 'nginx'})
deployment.spec().template().spec().containers().name('nginx').image(
    'nginx:latest').ports([
        {
            'containerPort': 80
        }])
# deployment.debug()

ingress = Ingress()
ingress.apiVersion('networking.k8s.io/v1')
ingress.metadata().name('nginx')
ingress.metadata().namespace('development')
ingress.metadata().annotations({'ingress.kubernetes.io/ssl-redirect':
"false"})
ingress.spec().rules([
    # 'host': 'www.netkiller.cn',
```

```

    'http': {
        'paths': [{
            'path': '/',
            'pathType': 'Prefix',
            'backend': {
                'service': {
                    'name': 'nginx',
                    'port': {
                        'number': 80
                    }
                }
            }
        }]
    }
}])
# ingress.debug()

compose = Compose('development')
compose.add(namespace)
compose.add(service)
compose.add(deployment)
compose.add(ingress)
# compose.debug()
# compose.yaml()
# compose.save('/tmp/test.yaml')

kubernetes = Kubernetes()
kubernetes.compose(compose)
# kubernetes.debug()
# print(kubernetes.dump())
kubernetes.main()

```

查看帮助信息 /usr/bin/python3 nginx.py -h

```

→ devops git:(master) ✘ /usr/bin/python3 nginx.py -h
Usage: nginx.py [options] <command>

Options:
  -h, --help                  show this help message and exit
  -e development|testing|production, --
environment=development|testing|production
                                environment
  -l, --list                   print service of environment

Cluster Management Commands:

```

```

        -g, --get          Display one or many resources
        -c, --create       Create a resource from a file or from stdin
        -d, --delete       Delete resources by filenames, stdin, resources
and
        -r, --replace      Replace a resource by filename or stdin

Namespace:
        -n, --namespace    Display namespace
        -s, --service       Display service

Others:
        --logfile=LOGFILE  logs file.
        -y, --yaml         show yaml compose
        --export           export docker compose
        --debug            debug mode
        -v, --version      print version information

```

现在开始部署 nginx 使用参数 -c，命令 /usr/bin/python3 nginx.py -c

```

→ devops git:(master) ✘ /usr/bin/python3 nginx.py -c
namespace/development created
service/nginx created
deployment.apps/nginx created
ingress.networking.k8s.io/nginx created

```

查看部署状态

```

→ devops git:(master) ✘ kubectl get namespace
NAME      STATUS   AGE
default   Active   3h15m
kube-system   Active   3h15m
kube-public   Active   3h15m
kube-node-lease Active   3h15m
development   Active   21m

→ devops git:(master) ✘ kubectl get service -n development
NAME      TYPE      CLUSTER-IP      EXTERNAL-IP      PORT(S)      AGE
nginx    NodePort   10.43.19.13   <none>        80:31258/TCP   21m

→ devops git:(master) ✘ kubectl get deployment -n development
NAME      READY     UP-TO-DATE   AVAILABLE   AGE

```

```
nginx    2/2      2           2           21m

→ devops git:(master) ✘ kubectl get ingress -n development
NAME      CLASS      HOSTS      ADDRESS          PORTS      AGE
nginx     <none>     *          172.23.0.2,172.23.0.3   80        21m
```

## 检验 nginx 启动情况

```
→ devops git:(master) ✘ curl http://localhost
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
```

## 3.2. 创建命名空间

```
import os, sys
from netkiller.kubernetes import *

print("=" * 40, "Namespace", "=" * 40)
```

```

namespaces = []
environment = ['development', 'testing', 'production']
for name in environment :
    namespace = Namespace(name)
    namespace.metadata().name(name)
    namespace.metadata().namespace(name)
    # namespace.debug()
    namespaces.append(namespace)

compose = Compose('development')
for ns in namespaces :
    compose.add(ns)

# compose.debug()
# compose.save('/tmp/test.yaml')
# compose.delete()
compose.create()

```

### 3.3. ConfigMap/Secret 编排演示

#### ConfigMap 实例

```

from netkiller.kubernetes import *

config = ConfigMap()
config.apiVersion('v1')
config.metadata().name('test').namespace('test')
config.data({'host':'localhost','port':3306,'user':'root','pass':'1234
56'})
config.data({'redis.conf':pss(
    'pidfile /var/lib/redis/redis.pid\n'
    'dir /var/lib/redis\n'
    'port 6379\n'
    'bind 0.0.0.0\n'
    'appendonly yes\n'
    'protected-mode no\n'
    'requirepass 123456\n'
)
})
config.data({'dbhost':'localhost','dbport':3306,'dbuser':'root','dbpas
s':'123456'}).data({'mysql.cnf':pss(''')
mysql.db = devops
mysql.host = 127.0.0.1
mysql.user = root
mysql.pwd = root123

```

```
mysql.port = 3306
'''))}
config.json()
config.debug()
```

## 输出结果

```
metadata:
  name: test
  namespace: test
data:
  host: localhost
  port: 3306
  user: root
  pass: '123456'
  redis.conf: |
    pidfile /var/lib/redis/redis.pid
    dir /var/lib/redis
    port 6379
    bind 0.0.0.0
    appendonly yes
    protected-mode no
    requirepass 123456
  dbhost: localhost
  dbport: 3306
  dbuser: root
  dbpass: '123456'
  mysql.cnf: |
    mysql.db = devops
    mysql.host = 127.0.0.1
    mysql.user = root
    mysql.pwd = root123
    mysql.port = 3306
apiVersion: v1
kind: ConfigMap
```

## Secret 实例

```
secret = Secret()
secret.metadata().name('tls').namespace('development')
secret.data({'tls.crt':' ','tls.key':' '})
```

```
secret.type('kubernetes.io/tls')
secret.debug()
```

## Secret 运行结果

```
metadata:
  name: tls
  namespace: development
data:
  tls.crt: ' '
  tls.key: ' '
type: kubernetes.io/tls
apiVersion: v1
kind: Secret
```

## 从文件创建 ConfigMap

```
from netkiller.kubernetes import *

print("=" * 40, "ConfigMap", "=" * 40)
config = ConfigMap()
config.apiVersion('v1')
config.metadata().name('test').namespace('default')
config.from_file('redis.conf',
 '/etc/redis/redis.conf').from_file('nginx.conf','/etc/nginx/nginx.conf'
 ')
```

## 从环境变量文件创建 ConfigMap

```
config = ConfigMap('test')
config.apiVersion('v1')
config.metadata().name('test').namespace('test')
config.from_env_file('config.env')
config.debug()
```

```
neo@Netkiller-iMac ~/w/d/d/k8s (master) [1]> cat config.env
key=value
dev.logfile=/tmp/logfile.log
dev.tmpdir=/tmp
```

## 运行结果

```
neo@Netkiller-iMac ~/w/d/d/k8s (master)> python3
/Users/neo/workspace/devops/demo/k8s/demo.py
metadata:
  name: test
  namespace: test
data:
  key: value
  dev.logfile: /tmp/logfile.log
  dev.tmpdir: /tmp
apiVersion: v1
kind: ConfigMap
```

## 3.4. Pod 挂载 ConfigMap 编排演示

```
from netkiller.kubernetes import *

print("=" * 40, "ConfigMap", "=" * 40)
config = ConfigMap()
config.apiVersion('v1')
config.metadata().name('test').namespace('default')
config.data({'redis.conf':pss(
    'pidfile /var/lib/redis/redis.pid\n'
    'dir /var/lib/redis\n'
    'port 6379\n'
    'bind 0.0.0.0\n'
    'appendonly yes\n'
    'protected-mode no\n'
    'requirepass 123456\n'
)
})
config.debug()
```

```

print("=" * 40, "Pod", "=" * 40)

pod = Pod()
pod.metadata().name('busybox')
pod.spec().containers().name('test').image('busybox').command([
"/bin/sh", "-c", "cat /tmp/config/redis.conf"
]).volumeMounts([{'name': 'config-
volume', 'mountPath': '/tmp/config/redis.conf', 'subPath': 'redis.conf'}])
pod.spec().volumes().name('config-volume').configMap({'name': 'test'})
# , 'items':[{'key': 'redis.conf', 'path': 'keys'}]
pod.debug()

print("=" * 40, "Compose", "=" * 40)
compose = Compose('development')
# compose.add(namespace)
compose.add(config)
compose.add(pod)

compose.delete()
compose.create()

print("=" * 40, "Busybox", "=" * 40)
os.system("sleep 10 && kubectl logs busybox")

```

生成 yaml 内容

```

metadata:
  name: test
  namespace: default
data:
  redis.conf: |
    pidfile /var/lib/redis/redis.pid
    dir /var/lib/redis
    port 6379
    bind 0.0.0.0
    appendonly yes
    protected-mode no
    requirepass 123456
apiVersion: v1
kind: ConfigMap
---
metadata:
  name: busybox
spec:
  containers:

```

```
- name: test
  image: busybox
  command:
    - /bin/sh
    - -c
    - cat /tmp/config/redis.conf
  volumeMounts:
    - name: config-volume
      mountPath: /tmp/config/redis.conf
      subPath: redis.conf
  volumes:
    - name: config-volume
      configMap:
        name: test
apiVersion: v1
kind: Pod
```

## 运行结果

```
configmap "test" deleted
pod "busybox" deleted
configmap/test created
pod/busybox created
=====
=====
pidfile /var/lib/redis/redis.pid
dir /var/lib/redis
port 6379
bind 0.0.0.0
appendonly yes
protected-mode no
requirepass 123456
```

## 3.5. Pod 挂载 ConfigMap 设置环境变量

```
import os,sys
sys.path.insert(0, '/Users/neo/workspace/devops')
from netkiller.kubernetes import *

print("=" * 40, "ConfigMap", "=" * 40)
config = ConfigMap()
```

```

config.apiVersion('v1')
config.metadata().name('test').namespace('default')
config.data({'host': 'localhost', 'port': '3306', 'user': 'root', 'pass': '12
3456'})
config.from_file('nginx.conf',
 '/etc/nginx/nginx.conf').from_env_file('redis.conf', 'redis.env')

pod = Pod()
pod.metadata().name('busybox')
pod.spec().containers().name('test').image('busybox').command([
 "/bin/sh", "-c", "env" ]).env([{'name': 'DBHOST', 'valueFrom':
 {'configMapKeyRef': {'name': 'test', 'key': 'host'}}}])

compose = Compose('development')
compose.add(config)
compose.add(pod)
compose.delete()
compose.create()

print("=" * 40, "Busybox", "=" * 40)
os.system("sleep 10 && kubectl logs busybox")

```

## 输出结果

```

configmap "test" deleted
pod "busybox" deleted
configmap/test created
pod/busybox created
=====
===== Busybox
=====
KUBERNETES_PORT=tcp://10.43.0.1:443
KUBERNETES_SERVICE_PORT=443
HOSTNAME=busybox
SHLVL=1
HOME=/root
DBHOST=localhost
KUBERNETES_PORT_443_TCP_ADDR=10.43.0.1
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin
KUBERNETES_PORT_443_TCP_PORT=443
KUBERNETES_PORT_443_TCP_PROTO=tcp
KUBERNETES_SERVICE_PORT_HTTPS=443
KUBERNETES_PORT_443_TCP=tcp://10.43.0.1:443
KUBERNETES_SERVICE_HOST=10.43.0.1
PWD=/

```

DBHOST=localhost

### 3.6. Ingress 挂载 SSL 证书

准备 SSL 证书，如果你没有，可以使用下面命令创建

```
制作私钥证书
openssl genrsa -out ingress.key 2048

制作公钥证书
openssl req -new -x509 -days 3650 -key ingress.key -out ingress.crt

mkdir -p cert/private
cp ingress.crt cert/netkiller.cn.crt
cp ingress.key cert/private/netkiller.cn.key
```

### 编排脚本

```
import sys
sys.path.insert(0, '/Users/neo/workspace/devops')
from netkiller.kubernetes import *

namespace = 'default'

# namespace = Namespace()
# namespace.metadata().name(namespace)
# namespace.metadata().namespace(namespace)
# namespace.debug()

secret = Secret('ingress-secret')
secret.metadata().name('tls').namespace(namespace)
# secret.data({'tls.crt': ' ', 'tls.key': ' '})
secret.cert('cert/netkiller.cn.crt')
secret.key('cert/private/netkiller.cn.key')
secret.type('kubernetes.io/tls')
# secret.save()
# secret.debug()
# exit()

service = Service()
service.metadata().name('nginx')
service.metadata().namespace(namespace)
service.spec().selector({'app': 'nginx'})
```

```

service.spec().type('NodePort')
service.spec().ports([
    'name': 'http',
    'protocol': 'TCP',
    'port': 80,
    'targetPort': 80
]))
deployment = Deployment()
deployment.apiVersion('apps/v1')

deployment.metadata().name('nginx').labels(
    {'app': 'nginx'}).namespace(namespace)
deployment.spec().replicas(1)
deployment.spec().selector({'matchLabels': {'app': 'nginx'}})
deployment.spec().template().metadata().labels({'app': 'nginx'})
deployment.spec().template().spec().containers().name('nginx').image(
    'nginx:latest').ports([
        {
            'containerPort': 80
        }
])
# deployment.debug()
# deployment.json()

ingress = Ingress()
ingress.apiVersion('networking.k8s.io/v1')
ingress.metadata().name('nginx')
ingress.metadata().namespace(namespace)
ingress.metadata().annotations({'ingress.kubernetes.io/ssl-redirect':
"true"})
ingress.spec().tls([
    {'hosts': [
        'www.netkiller.cn', 'admin.netkiller.cn'],
     'secretName': 'tls'}])
ingress.spec().rules([
    {
        'host': 'www.netkiller.cn',
        'http': {
            'paths': [
                {
                    'path': '/',
                    'pathType': 'Prefix',
                    'backend': {
                        'service': {
                            'name': 'nginx',
                            'port': {
                                'number': 80
                            }
                        }
                    }
                }
            ]
        }
    }
]))
# ingress.debug()

```

```

print("=" * 40, "Compose", "=" * 40)
compose = Compose('development')
# compose.add(namespace)
compose.add(secret)
compose.add(service)
compose.add(deployment)
compose.add(ingress)
# compose.debug()
# compose.save('/tmp/test.yaml')
compose.delete()
compose.create()

print("=" * 40, "Busybox", "=" * 40)
os.system("sleep 5")
for cmd in ['kubectl get secret tls','kubectl get pods','kubectl get service','kubectl get deployment','kubectl get ingress'] :
    os.system(cmd)
    print("-" * 50)

```

## 启动后使用 openssl 检查证书

```

neo@Netkiller-iMac ~> openssl s_client -connect www.netkiller.cn:443
CONNECTED(00000003)
depth=0 CN = TRAEFIK DEFAULT CERT
verify error:num=20:unable to get local issuer certificate
verify return:1
depth=0 CN = TRAEFIK DEFAULT CERT
verify error:num=21:unable to verify the first certificate
verify return:1
---
Certificate chain
0 s:/CN=TRAEFIK DEFAULT CERT
 i:/CN=TRAEFIK DEFAULT CERT
---
Server certificate
-----BEGIN CERTIFICATE-----
MIIDXjCCAkagAwIBAgIRAPLS5GF1qTUbZuNxXxu9SGEwDQYJKoZIhvcNAQELBQA
HzEdMBsGA1UEAxMUVFJBRUZJSyBERUZBVUxUIENFULQwHhcNMjIwMTE0MDQwNDU2
WhcNMjMwMTE0MDQwNDU2WjAfMR0wGwYDVQQDEXRUUKFFRk1LIERFRkFVTFQgQ0VS
VDCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBALTuaTUNs89KKUm6dG8M
JUCdqsNLsG0a3690+VjSSgJnrYb9BL8ZTCTYTu44y8cepH+mMdq1SVmDpXwyMVPu
CuXYDnrK2n6Zdv9T9K59pKOu08GoRmF7kmxmA8d4UGbDR5D01AEjOLvd8EKzRJqi
tB8KP5KEjdVUQYB7ZUy3EHSSfyM+grN/XbWn0Sfj7VGWnUBS+WG9Huvi+vgHwU5W
r+JL5ojsWw7q6glG45x3iIjqYNaVWqRwuSoH905AIA9Q2mCpRjNNQJL1sUYxHFfd
mYlOW47ovKIw/OR48lqlwZy8/Yb1DveIn66kEAF7Y3EGDQuUB211SW6q7qNum7lq
-----END CERTIFICATE-----

```

```
S5MCAwEAAaOB1DCBkTAOBgNVHQ8BAf8EBAMCA7gwEwYDVR01BAwwCgYIKwYBBQUH
AwEwDAYDVR0TAQH/BAIwADBeBgNVHREEVTBgle0NNjOThINDQ0MT1mOTM20Dcw
YTU5YTZkN2EyZWRhZC51MWIyMDRmZTVjMTlhZGJjNWE4NjE3Nja0YzkxNGI4OS50
cmFlZmlrLmRlZmF1bHQwDQYJKoZIhvcNAQELBQADggEBAG+BrjgG0Z8j4/G08eCJ
elVpUaxCXzWEC6KgPmQPpgYGh98PcrZNe4E/FnaKJ9pjta7NpG8Y2Ke+D3D8H+MQ
hutT9+XtGRU93zxpT3SVxJLQnx3511s0jAfj3sCxyvuv17bT+q8C0KjQf9k6HMT
X/oBsND0HXrDbdsUK4f2scdmql0CK/uAj0ibjfajfCc5Ve5hQw1a5x2StCvQZAB
6TO8YQpFR+TeIbyclr++tYLBBoc10E3nXFommYPt2zxiY1K129fNPRfmq+yKbuzV
4u1KLRWIUJnab6Ue7ezJLCNT5T0bVXSG089yeaB/MdPRVkbAMHXF+AxQDUu9iZx+
8Aw=
-----END CERTIFICATE-----
subject=/CN=TRAEFIK DEFAULT CERT
issuer=/CN=TRAEFIK DEFAULT CERT
---
No client certificate CA names sent
Server Temp Key: ECDH, X25519, 253 bits
---
SSL handshake has read 1454 bytes and written 289 bytes
---
New, TLSv1/SSLv3, Cipher is ECDHE-RSA-AES256-GCM-SHA384
Server public key is 2048 bit
Secure Renegotiation IS supported
Compression: NONE
Expansion: NONE
No ALPN negotiated
SSL-Session:
    Protocol : TLSv1.2
    Cipher   : ECDHE-RSA-AES256-GCM-SHA384
    Session-ID:
0A39917DAE8C45B5495FA7CDEF733CF524A117E070B37428C984550AB9382993
    Session-ID-ctx:
    Master-Key:
F9F5464856CE3D12437AC45843A07732C1A313E99240F6C8AAD6A8BEC957786237846A68
7B62C5A4A6362FD738B68F2D
    TLS session ticket:
    0000 - ca 1d cc 1f fa ea 48 88-f2 d8 b2 94 ac 32 d0 f4
.....H.....2..
    0010 - 4f ad 8c de 17 49 97 c8-7f 73 2d 3d 04 86 86 f0      0....I...-
=.....
    0020 - 9c 51 e3 60 50 c6 ab 70-3d a6 8a a5 5c 50 c7 04
.Q.^P..p=...`P..
    0030 - 89 93 89 a6 d5 c5 73 ac-2a 3f f6 1c 7b 26 5f 70
.....S.*?..{&_p
    0040 - 0b 27 ae bd 5b 37 b0 f4-76 79 5d 9d 90 10 f5 24      .'..
[7...vy]....$_
    0050 - ef 64 04 4b cd ad c3 83-2b f3 a4 37 6a 83 f8 ce
.d.K....+..7j...
    0060 - 6e 18 e3 72 64 a9 c1 6c-7d 24 9a 1d f6 b7 76 d7
n..rd..1}$.v...
    0070 - 68 ee 8f 76 27 06 bf 84-4d 6d 33 f3 b7 c5 4e d4
h...v'....Mm3...N.
```

```
0080 - 32                                         2

Start Time: 1642133830
Timeout   : 7200 (sec)
Verify return code: 21 (unable to verify the first certificate)
--
```

证书载入正确，就可以使用 curl 命令或者Safari测试了

```
neo@Netkiller-iMac ~> curl https://www.netkiller.cn
```

如果是自签名证书，需要使用 -k 参数

```
neo@Netkiller-iMac ~> curl -k https://www.netkiller.cn
```

### 3.7. StatefulSet 部署 Redis

```
import sys
sys.path.insert(0, '/Users/neo/workspace/devops')
from netkiller.kubernetes import *
namespace = 'default'

config = ConfigMap('redis')
config.metadata().name('redis').namespace(namespace).labels({'app':
'redis'})
config.data({'redis.conf': pss('''\
pidfile /var/lib/redis/redis.pid
dir /data
port 6379
bind 0.0.0.0
appendonly yes
protected-mode yes
requirepass passw0rd
maxmemory 2mb
maxmemory-policy allkeys-lru
''')})
```

```

# config.debug()

statefulSet = StatefulSet()
statefulSet.metadata().name('redis')
statefulSet.spec().replicas(1)
statefulSet.spec().serviceName('redis')
statefulSet.spec().selector({'matchLabels': {'app': 'redis'}})
statefulSet.spec().template().metadata().labels({'app': 'redis'})
#
statefulSet.spec().template().spec().initContainers().name('busybox').
image('busybox').command(['sh', '-c', 'mkdir -p /var/lib/redis && echo
2048 > /proc/sys/net/core/somaxconn && echo never >
/sys/kernel/mm/transparent_hugepage/enabled']).volumeMounts([
#           {'name': 'data', 'mountPath': '/var/lib/redis'}])
statefulSet.spec().template().spec().containers().name('redis').image(
    'redis:latest').command(['sh', '-c', 'redis-server
/usr/local/etc/redis.conf']).ports([
    {'name': 'redis',
     'protocol': 'TCP',
     'containerPort': 6379
  }]).volumeMounts([
    {'name': 'config', 'mountPath': '/usr/local/etc/redis.conf',
     'subPath': 'redis.conf'},
    {'name': 'data', 'mountPath': '/data',
     'subPath': 'default.conf'}
  ]).imagePullPolicy('IfNotPresent')
statefulSet.spec().template().spec().volumes().name(
    'config').configMap({'name': 'redis'})
statefulSet.spec().template().spec().volumes().name(
    'data').hostPath({'path': '/var/lib/redis'})
# statefulSet.debug()
# exit()

service = Service()
service.metadata().name('redis')
service.metadata().namespace(namespace).labels({'app': 'redis'})
service.spec().selector({'app': 'redis'})
# service.spec().type('NodePort')
service.spec().ports([
    # 'name': 'redis',
    # 'protocol': 'TCP',
    'port': 6379,
    'targetPort': 6379
  ])
}

ingress = IngressRouteTCP()
ingress.metadata().name('redis')
ingress.metadata().namespace(namespace)
ingress.spec().entryPoints(['redis'])
ingress.spec().routes([

```

```

'match': 'HostSNI(`*`)',
'services': [{
    'name': 'redis',
    'port': 6379
}]
}])
# ingress.debug()

print("=" * 40, "Compose", "=" * 40)
compose = Compose('development')
# compose.add(namespace)
compose.add(config)
compose.add(statefulSet)
compose.add(service)
compose.add(ingress)
compose.debug()
# compose.save()
compose.delete()
compose.create()

```

### 检查 redis 是否工作正常

```

neo@Netkiller-iMac ~> kubectl get pods
NAME           READY   STATUS      RESTARTS   AGE
nginx-88c84c4d8-gb5rg   1/1     Running      1          3d16h
redis-0        1/1     Running      0          14h
busybox        0/1     CrashLoopBackOff  256        21h

neo@Netkiller-iMac ~> kubectl exec -it "redis-0" bash
kubectl exec [POD] [COMMAND] is DEPRECATED and will be removed in a
future version. Use kubectl exec [POD] -- [COMMAND] instead.
root@redis-0:/data# redis-cli -a passw0rd
Warning: Using a password with '-a' or '-u' option on the command line
interface may not be safe.
127.0.0.1:6379> set nickname netkiller
OK
127.0.0.1:6379> get nickname
"netkiller"
127.0.0.1:6379>

```

## 3.8. StorageClass

```
storageClass = StorageClass('local-storage')
storageClass.metadata().name('local-storage')
storageClass.provisioner('kubernetes.io/no-provisioner')
storageClass.volumeBindingMode('WaitForFirstConsumer')
# storageClass.json()
# storageClass.debug()
```

```
persistentVolume = PersistentVolume()
persistentVolume.metadata().name('redis').annotations({'pv.kubernetes.
io/provisioned-by': 'rancher.io/local-path'})
persistentVolume.spec().capacity({'storage': '1Gi'})
persistentVolume.spec().accessModes(['ReadWriteOnce'])
persistentVolume.spec().persistentVolumeReclaimPolicy('Retain')
persistentVolume.spec().storageClassName('local-path')
# persistentVolume.spec().local('/opt/redis')
persistentVolume.spec().hostPath({'path':
    '/var/lib/rancher/k3s/storage/redis', 'type': 'DirectoryOrCreate'})
persistentVolume.spec().nodeAffinity({
    'required':{
        'nodeSelectorTerms':[
            {'matchExpressions':[
                {'key': 'kubernetes.io/hostname',
                 'operator': 'In',
                 'values':[ 'node1' ]
                }]
            }
        }
    }
})
```

### 3.9. 部署 MySQL 到 kubernetes

```
from netkiller.kubernetes import *
namespace = 'default'

config = ConfigMap('mysql')
config.metadata().name('mysql').namespace(namespace).labels({'app':
'mysql'})
config.data({'mysql.cnf': pss('''\
```

```

[mysqld]
max_connections=2048
max_execution_time=120
connect_timeout=120
max_allowed_packet=32M
net_read_timeout=120
net_write_timeout=120
# --wait_timeout=60
# --interactive_timeout=60

sql_mode=STRICT_TRANS_TABLES,NO_ZERO_IN_DATE,NO_ZERO_DATE,ERROR_FOR_D
VISION_BY_ZERO,NO_ENGINE_SUBSTITUTION
character-set-server=utf8mb4
collation-server=utf8mb4_general_ci
explicit_defaults_for_timestamp=true
max_execution_time=0
'''))
config.data({'MYSQL_ROOT_PASSWORD': '123456', 'MYSQL_DATABASE':
'test',
'MYSQL_USER': 'test', 'MYSQL_PASSWORD': 'test'})
# config.debug()

storageClassName = 'manual'
persistentVolume = PersistentVolume('mysql-pv')
persistentVolume.metadata().name(
    'mysql-pv').labels({'type': 'local'})
persistentVolume.spec().storageClassName(storageClassName)
persistentVolume.spec().capacity({'storage': '2Gi'}).accessModes(
    ['ReadWriteOnce']).hostPath({'path': "/var/lib/mysql"})
persistentVolume.debug()

persistentVolumeClaim = PersistentVolumeClaim('mysql-pvc')
persistentVolumeClaim.metadata().name('mysql-pvc')
persistentVolumeClaim.spec().storageClassName(storageClassName)
persistentVolumeClaim.spec().resources({'requests':
{'storage':'2Gi'}})
persistentVolumeClaim.spec().accessModes(
    ['ReadWriteOnce'])
persistentVolumeClaim.debug()
# exit()

statefulSet = StatefulSet()
statefulSet.metadata().name('mysql')
statefulSet.spec().replicas(1)
statefulSet.spec().serviceName('mysql')
statefulSet.spec().selector({'matchLabels': {'app': 'mysql'}})
statefulSet.spec().template().metadata().labels({'app': 'mysql'})
statefulSet.spec().replicas(1)
statefulSet.spec().template().spec().containers().name('mysql').image(

```

```

'mysql:latest').ports([
    'name': 'mysql',
    'protocol': 'TCP',
    'containerPort': 3306
}]).env([
    {'name': 'MYSQL_ROOT_PASSWORD', 'value': '123456'}
]).volumeMounts([
    {'name': 'config', 'mountPath': '/etc/mysql/conf.d/mysql.cnf',
     'subPath': 'mysql.cnf'},
    {'name': 'data', 'mountPath': '/var/lib/mysql'}
]).imagePullPolicy('IfNotPresent')
statefulSet.spec().template().spec().volumes().name(
    'config').configMap({'name': 'mysql'})
statefulSet.spec().template().spec().volumes().name(
    'data').persistentVolumeClaim('mysql-pvc')
# statefulSet.debug()

service = Service()
service.metadata().name('mysql')
service.metadata().namespace(namespace).labels({'app': 'mysql'})
service.spec().selector({'app': 'mysql'})
service.spec().type('NodePort')
service.spec().ports([
    {'name': 'mysql',
     'protocol': 'TCP',
     'port': 3306,
     'targetPort': 3306
}])

print("=" * 40, "Compose", "=" * 40)
compose = Compose('development')
# compose.add(namespace)
compose.add(config)
compose.add(persistentVolume)
compose.add(persistentVolumeClaim)
compose.add(statefulSet)
compose.add(service)
compose.debug()
# compose.save()
compose.delete()
compose.create()

```

NAME	READY	STATUS	RESTARTS	AGE
nginx-88c84c4d8-gb5rg	1/1	Running	1	4d
redis-0	1/1	Running	0	22h
mysql-0	1/1	Running	0	9m11s
busybox	0/1	CrashLoopBackOff	346	29h

```

neo@Netkiller-iMac ~> kubectl get service
NAME          TYPE      CLUSTER-IP      EXTERNAL-IP      PORT(S)
AGE
kubernetes    ClusterIP   10.43.0.1      <none>        443/TCP
12d
nginx         NodePort    10.43.125.134  <none>        80:31656/TCP
4d
redis         ClusterIP   10.43.91.64    <none>        6379/TCP
22h
mysql         NodePort    10.43.198.188  <none>        3306:32322/TCP
9m22s

neo@Netkiller-iMac ~ [1]> kubectl exec mysql-0 -it bash
kubectl exec [POD] [COMMAND] is DEPRECATED and will be removed in a
future version. Use kubectl exec [POD] -- [COMMAND] instead.

root@mysql-0:/# mysql -uroot -p
Enter password:
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 9
Server version: 8.0.27 MySQL Community Server - GPL

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Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input
statement.

mysql> show databases;
+-----+
| Database           |
+-----+
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+-----+
4 rows in set (0.00 sec)

mysql> create database test;
Query OK, 1 row affected (0.16 sec)

mysql> exit
Bye
root@mysql-0:/#

```

## 3.10. MongoDB

```
import sys
sys.path.insert(0, '/Users/neo/workspace/devops')
from netkiller.kubernetes import *
namespace = 'default'

config = ConfigMap('mongo')
config.metadata().name('mongo').namespace(namespace).labels({'app': 'mongo'})
config.data({'mongod.cnf': pss('''\
# mongod.conf

# for documentation of all options, see:
#   http://docs.mongodb.org/manual/reference/configuration-options/

# Where and how to store data.
storage:
  dbPath: /var/lib/mongo
  journal:
    enabled: true
# engine:
#   wiredTiger:

# where to write logging data.
systemLog:
  destination: file
  logAppend: true
  path: /var/log/mongodb/mongod.log

# network interfaces
net:
  port: 27017
  bindIp: 0.0.0.0

# how the process runs
processManagement:
  timeZoneInfo: /usr/share/zoneinfo

security:
  authorization: enabled

#operationProfiling:

#replication:

#sharding:
```

```

## Enterprise-Only Options:

#auditLog:

#snmp:
'''))}
config.data({'mongo_ROOT_PASSWORD': '123456', 'mongo_DATABASE': 'test',
'mongo_USER': 'test', 'mongo_PASSWORD': 'test'})
# config.debug()

storageClassName = 'manual'
persistentVolume = PersistentVolume('mongo-pv')
persistentVolume.metadata().name(
    'mongo-pv').labels({'type': 'local'})
persistentVolume.spec().storageClassName(storageClassName)
persistentVolume.spec().capacity({'storage': '2Gi'}).accessModes(
    ['ReadWriteOnce']).hostPath({'path': "/var/lib/mongodb"})
persistentVolume.debug()

persistentVolumeClaim = PersistentVolumeClaim('mongo-pvc')
persistentVolumeClaim.metadata().name('mongo-pvc')
persistentVolumeClaim.spec().storageClassName(storageClassName)
persistentVolumeClaim.spec().resources({'requests':
{'storage':'2Gi'}})
persistentVolumeClaim.spec().accessModes(
    ['ReadWriteOnce'])
persistentVolumeClaim.debug()
# exit()

statefulSet = StatefulSet()
statefulSet.metadata().name('mongo')
statefulSet.spec().replicas(1)
statefulSet.spec().serviceName('mongo')
statefulSet.spec().selector({'matchLabels': {'app': 'mongo'}})
statefulSet.spec().template().metadata().labels({'app': 'mongo'})
statefulSet.spec().replicas(1)
statefulSet.spec().template().spec().containers().name('mongo').image(
    'mongo:latest').ports([
        {'name': 'mongo',
         'protocol': 'TCP',
         'containerPort': 27017
    }]).env([
        {'name': 'TZ', 'value': 'Asia/Shanghai'},
        {'name': 'LANG', 'value': 'en_US.UTF-8'},
        {'name': 'MONGO_INITDB_DATABASE', 'value': 'admin'},
        {'name': 'MONGO_INITDB_ROOT_USERNAME', 'value': 'admin'},
        {'name': 'MONGO_INITDB_ROOT_PASSWORD', 'value':

```

```

'A8nWiX7vitsqOsqoWVnTtv4BDG6uMbexYX9s' }

]).volumeMounts([
    {'name': 'config', 'mountPath': '/etc/mongod.conf',
     'subPath': 'mongo.cnf'},
    {'name': 'data', 'mountPath': '/var/lib/mongodb'}
]).imagePullPolicy('IfNotPresent')
statefulSet.spec().template().spec().volumes().name(
    'config').configMap({'name': 'mongo'})
statefulSet.spec().template().spec().volumes().name(
    'data').persistentVolumeClaim('mongo-pvc')
# statefulSet.debug()
# exit()

service = Service()
service.metadata().name('mongo')
service.metadata().namespace(namespace).labels({'app': 'mongo'})
service.spec().selector({'app': 'mongo'})
service.spec().type('NodePort')
service.spec().ports([{
    'name': 'mongo',
    'protocol': 'TCP',
    'port': 27017,
    'targetPort': 27017
}])

ingress = IngressRouteTCP()
ingress.metadata().name('mongo')
ingress.metadata().namespace(namespace)
ingress.spec().entryPoints(['mongo'])
ingress.spec().routes([{
    'match': 'HostSNI(`*`)',
    'services': [{
        'name': 'mongo',
        'port': 27017,
    }]
}])
# ingress.debug()

print("=" * 40, "Compose", "=" * 40)
compose = Compose('development')
# compose.add(namespace)
compose.add(config)
compose.add(persistentVolume)
compose.add(persistentVolumeClaim)
compose.add(statefulSet)
compose.add(service)
compose.add(ingress)
compose.debug()
# compose.save()
compose.delete()
compose.create()

```

进入容器，检查是否工作正常

```
neo@Netkiller-iMac ~> kubectl get all
NAME                      READY   STATUS    RESTARTS   AGE
pod/mongo-0                1/1     Running   0          164m
pod/mysql-0                1/1     Running   0          149m
pod/nginx-88c84c4d8-dwz9x  1/1     Running   0          147m
pod/redis-0                1/1     Running   0          132m
pod/busybox                0/1     CrashLoopBackOff 436       2d2h

NAME            TYPE        CLUSTER-IP      EXTERNAL-IP      PORT(S)
AGE
service/kubernetes  ClusterIP   10.43.0.1      <none>           443/TCP
13d
service/mongo     NodePort    10.43.135.49   <none>
27017:32598/TCP  164m
service/mysql     NodePort    10.43.186.2    <none>
3306:32440/TCP  149m
service/nginx     NodePort    10.43.235.124   <none>
80:32124/TCP    147m
service/redis     NodePort    10.43.134.73   <none>
6379:30376/TCP  133m

NAME          READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/nginx  1/1      1           1           147m

NAME          DESIRED   CURRENT   READY   AGE
replicaset.apps/nginx-88c84c4d8  1         1         1       147m

NAME          READY   AGE
statefulset.apps/mongo  1/1     164m
statefulset.apps/mysql  1/1     149m
statefulset.apps/redis  1/1     133m

neo@Netkiller-iMac ~> kubectl exec -it mongo-0 -- bash
root@mongo-0:/# ps ax
  PID TTY      STAT   TIME COMMAND
    1 ?        Ssl      1:43 mongod --auth --bind_ip_all
   133 pts/0    Ss      0:00 bash
   141 pts/0    R+      0:00 ps ax

root@mongo-0:/# mongosh
mongodb://admin:A8nWiX7vitsqOsqoWVnTtv4BDG6uMbexYX9s@localhost/admin
```

```
Current Mongosh Log ID: 61e7acde14e7858c6d5dfcf6
Connecting to:          mongodb://<credentials>@localhost/admin?
directConnection=true&serverSelectionTimeoutMS=2000
Using MongoDB:         5.0.5
Using Mongosh:          1.1.7

For mongosh info see: https://docs.mongodb.com/mongodb-shell/

To help improve our products, anonymous usage data is collected and sent
to MongoDB periodically (https://www.mongodb.com/legal/privacy-policy).
You can opt-out by running the disableTelemetry() command.

-----
The server generated these startup warnings when booting:
2022-01-19T11:30:22.969+08:00: Using the XFS filesystem is strongly
recommended with the WiredTiger storage engine. See
http://dochub.mongodb.org/core/prodnotes-filesystem
-----

admin>
Browserslist: caniuse-lite is outdated. Please run:
npx browserslist@latest --update-db

Why you should do it regularly:
https://github.com/browserslist/browserslist#browsers-data-updating

admin> use test
switched to db test
test> db.createCollection("mycollection")
{ ok: 1 }
test> exit
root@mongo-0:/# exit
exit
```

## 端口转发

```
neo@Netkiller-iMac ~> kubectl port-forward --address 0.0.0.0
service/mongo 27017
Forwarding from 0.0.0.0:27017 -> 27017
```

## 远程登陆

```
[root@gitlab ~]# mongo
mongodb://admin:A8nWiX7vitsqOsqoWVnTtv4BDG6uMbexYX9s@192.168.30.131/admin
MongoDB shell version v5.0.5
connecting to: mongodb://192.168.30.131:27017/admin?
compressors=disabled&gssapiServiceName=mongodb
Implicit session: session { "id" : UUID("22b2d5ec-9643-492e-93df-12bb81ba21f4") }
MongoDB server version: 5.0.5
=====
Warning: the "mongo" shell has been superseded by "mongosh",
which delivers improved usability and compatibility. The "mongo" shell
has been deprecated and will be removed in
an upcoming release.
For installation instructions, see
https://docs.mongodb.com/mongodb-shell/install/
=====

---
The server generated these startup warnings when booting:
  2022-01-19T11:30:22.969+08:00: Using the XFS filesystem is
strongly recommended with the WiredTiger storage engine. See
http://dochub.mongodb.org/core/prodnotes-filesystem
---

---
      Enable MongoDB's free cloud-based monitoring service, which will
then receive and display
      metrics about your deployment (disk utilization, CPU, operation
statistics, etc).

      The monitoring data will be available on a MongoDB website with
a unique URL accessible to you
      and anyone you share the URL with. MongoDB may use this
information to make product
      improvements and to suggest MongoDB products and deployment
options to you.

      To enable free monitoring, run the following command:
db.enableFreeMonitoring()
      To permanently disable this reminder, run the following command:
db.disableFreeMonitoring()
---

> show databases
admin    0.000GB
config   0.000GB
local    0.000GB
test     0.000GB
> use test
switched to db test
> show tables
```

```
mycollection
> exit
bye
```

### 3.11. Nacos

#### 单节点部署

```
import sys
sys.path.insert(0, '/Users/neo/workspace/devops')
from netkiller.kubernetes import *

namespace = 'default'

# namespace = Namespace()
# namespace.metadata().name(namespace)
# namespace.metadata().namespace(namespace)
# namespace.debug()

config = ConfigMap('nacos')
config.apiVersion('v1')
config.metadata().name('nacos').namespace(namespace)
config.from_file('custom.properties',
'nacos/init.d/custom.properties')
config.data({'application.properties':pss('''\
    # spring
    server.servlet.contextPath=/nacos
    server.contextPath=/nacos
    server.port=8848
    spring.datasource.platform=mysql
    # nacos.cmdb.dumpTaskInterval=3600
    # nacos.cmdb.eventTaskInterval=10
    # nacos.cmdb.labelTaskInterval=300
    # nacos.cmdb.loadDataAtStart=false
    db.num=1
    # db.url.0=jdbc:mysql://mysql-0.mysql:3306/nacos?
    characterEncoding=utf8&connectTimeout=30000&socketTimeout=30000&autoRe
    connect=true&useSSL=false&serverTimezone=GMT%2B8
    # db.url.1=jdbc:mysql://mysql-0.mysql:3306/nacos?
    characterEncoding=utf8&connectTimeout=30000&socketTimeout=30000&autoRe
    connect=true&useSSL=false&serverTimezone=GMT%2B8
    db.url.0=jdbc:mysql://192.168.30.12:3306/nacos?
    characterEncoding=utf8&connectTimeout=30000&socketTimeout=30000&autoRe
    connect=true&useSSL=false&serverTimezone=GMT%2B8
    db.url.1=jdbc:mysql://192.168.30.12:3306/nacos?
```

```
characterEncoding=utf8&connectTimeout=30000&socketTimeout=30000&autoRe
connect=true&useSSL=false&serverTimezone=GMT%2B8
    # db.url.1=jdbc:mysql://mysql-
0.mysql.default.svc.cluster.local:3306/nacos?
characterEncoding=utf8&connectTimeout=3000&socketTimeout=3000&autoReco
nnect=true&useSSL=false&serverTimezone=Asia/Shanghai
    db.user=nacos
    db.password=nacos
    ### The auth system to use, currently only 'nacos' is supported:
    nacos.core.auth.system.type=nacos

    ### The token expiration in seconds:
nacos.core.auth.default.token.expire.seconds=${NACOS_AUTH_TOKEN_EXPIRE
_SECONDS:18000}

    ### The default token:
nacos.core.auth.default.token.secret.key=${NACOS_AUTH_TOKEN:SecretKey0
12345678901234567890123456789012345678901234567890123456789}

    ### Turn on/off caching of auth information. By turning on this
switch, the update of auth information would have a 15 seconds delay.
    nacos.core.auth.caching.enabled=${NACOS_AUTH_CACHE_ENABLE:false}

nacos.core.auth.enable.userAgentAuthWhite=${NACOS_AUTH_USER_AGENT_AUTH
_WHITE_ENABLE:false}

nacos.core.auth.server.identity.key=${NACOS_AUTH_IDENTITY_KEY:serverId
entity}

nacos.core.auth.server.identity.value=${NACOS_AUTH_IDENTITY_VALUE:secu
rity}
    server.tomcat.accesslog.enabled=${TOMCAT_ACCESSLOG_ENABLED:false}
    server.tomcat.accesslog.pattern=%h %l %u %t "%r" %s %b %D
    # default current work dir
    server.tomcat.basedir=
    ## spring security config
    ### turn off security

nacos.security.ignore.urls=${NACOS_SECURITY_IGNORE_URLS:/,/error,/**/*
.css,/**/*.js,/**/*.html,/**/*.map,/**/*.svg,/**/*.png,/**/*.ico,/cons
ole-
fe/public/**,/v1/auth/**,/v1/console/health/**,/actuator/**,/v1/consol
e/server/**}
    # metrics for elastic search
    management.metrics.export.elastic.enabled=false
    management.metrics.export.influx.enabled=false

nacos.naming.distro.taskDispatchThreadCount=10
```

```

nacos.naming.distro.taskDispatchPeriod=200
nacos.naming.distro.batchSyncKeyCount=1000
nacos.naming.distro.initDataRatio=0.9
nacos.naming.distro.syncRetryDelay=5000
nacos.naming.data.warmup=true
...
})
# config.save()
# config.debug()

# statefulSet = StatefulSet()
deployment = StatefulSet()
deployment.apiVersion('apps/v1')
deployment.metadata().name('nacos').labels(
    {'app': 'nacos'}).namespace(namespace)
deployment.spec().replicas(1)
deployment.spec().serviceName('nacos')
deployment.spec().selector({'matchLabels': {'app': 'nacos'}})
deployment.spec().template().metadata().labels({'app': 'nacos'})
deployment.spec().template().spec().containers().name('nacos').image(
    'nacos/nacos-server:2.0.3').env([
        {'name': 'TZ', 'value': 'Asia/Shanghai'},
        {'name': 'LANG', 'value': 'en_US.UTF-8'},
        {'name': 'PREFER_HOST_MODE', 'value': 'hostname'},
        {'name': 'MODE', 'value': 'standalone'},
        {'name': 'SPRING_DATASOURCE_PLATFORM', 'value': 'mysql'},
        {'name': 'JVM_XMX', 'value': '4g'},
        {'name': 'NACOS_DEBUG', 'value': 'true'},
        {'name': 'TOMCAT_ACCESSLOG_ENABLED', 'value': 'true'},
    ]).ports([
        {'containerPort': 8848},
        {'containerPort': 9848},
        {'containerPort': 9555}
    ]).volumeMounts([
        {'name': 'config', 'mountPath':
            '/home/nacos/conf/custom.properties', 'subPath': 'custom.properties'},
        {'name': 'config', 'mountPath':
            '/home/nacos/conf/application.properties', 'subPath':
            'application.properties'}
    ]).resources({'limits': {'memory': "4Gi"}, 'requests': {'memory':
        "2Gi"}})
# deployment.spec().template().spec().securityContext({'sysctls':
    [{'name': 'fs.file-max', 'value': '60000'}]})
deployment.spec().template().spec().volumes().name(
    'config').configMap({'name': 'nacos'})
# deployment.debug()
# deployment.json()

service = Service()
service.metadata().name('nacos')
service.metadata().namespace(namespace)

```

```

service.spec().selector({'app': 'nacos'})
service.spec().type('ClusterIP')
service.spec().ports([
    {'name': 'http', 'protocol': 'TCP', 'port': 8848, 'targetPort': 8848},
    {'name': 'rpc', 'protocol': 'TCP', 'port': 9848, 'targetPort': 9848},
    # {'name': 'http', 'protocol': 'TCP', 'port': 9555, 'targetPort': 9555}
])
print("=" * 40, "Compose", "=" * 40)
compose = Compose('development')
# compose.add(namespace)
compose.add(config)
compose.add(deployment)
compose.add(service)
# compose.debug()
compose.save()
compose.delete()
compose.create()

print("=" * 40, "Busybox", "=" * 40)
os.system("sleep 5")
for cmd in ['kubectl get secret tls', 'kubectl get configmap',
'kubectl get pods', 'kubectl get service', 'kubectl get deployment',
'kubectl get ingress']:
    os.system(cmd)
    print("-" * 50)

```

## 集群部署

```

import sys
sys.path.insert(0, '/Users/neo/workspace/devops')
from netkiller.kubernetes import *

namespace = 'default'

# namespace = Namespace()
# namespace.metadata().name(namespace)
# namespace.metadata().namespace(namespace)
# namespace.debug()

config = ConfigMap('nacos')

```

```

config.apiVersion('v1')
config.metadata().name('nacos').namespace(namespace)
config.from_file('custom.properties',
'nacos/init.d/custom.properties')
config.data({'application.properties':pss('''\
    # spring
    server.servlet.contextPath=/nacos
    server.contextPath=/nacos
    server.port=8848
    spring.datasource.platform=mysql
    # nacos.cmdb.dumpTaskInterval=3600
    # nacos.cmdb.eventTaskInterval=10
    # nacos.cmdb.labelTaskInterval=300
    # nacos.cmdb.loadDataAtStart=false
    db.num=1
    # db.url.0=jdbc:mysql://mysql-0.mysql:3306/nacos?
characterEncoding=utf8&connectTimeout=30000&socketTimeout=30000&autoRe
connect=true&useSSL=false&serverTimezone=GMT%2B8
    # db.url.1=jdbc:mysql://mysql-0.mysql:3306/nacos?
characterEncoding=utf8&connectTimeout=30000&socketTimeout=30000&autoRe
connect=true&useSSL=false&serverTimezone=GMT%2B8
    # db.url.1=jdbc:mysql://mysql-
0.mysql.default.svc.cluster.local:3306/nacos?
characterEncoding=utf8&connectTimeout=3000&socketTimeout=3000&autoReco
nnect=true&useSSL=false&serverTimezone=Asia/Shanghai
    db.user=nacos
    db.password=nacos
    ### The auth system to use, currently only 'nacos' is supported:
    nacos.core.auth.system.type=nacos

    ### The token expiration in seconds:

nacos.core.auth.default.token.expire.seconds=${NACOS_AUTH_TOKEN_EXPIRE
_SECONDS:18000}

    ### The default token:

nacos.core.auth.default.token.secret.key=${NACOS_AUTH_TOKEN:SecretKey0
12345678901234567890123456789012345678901234567890123456789}

    ### Turn on/off caching of auth information. By turning on this
switch, the update of auth information would have a 15 seconds delay.
    nacos.core.auth.caching.enabled=${NACOS_AUTH_CACHE_ENABLE:false}

nacos.core.auth.enable.userAgentAuthWhite=${NACOS_AUTH_USER_AGENT_AUTH
_WHITE_ENABLE:false}

nacos.core.auth.server.identity.key=${NACOS_AUTH_IDENTITY_KEY:serverId
entity}

```

```

nacos.core.auth.server.identity.value=${NACOS_AUTH_IDENTITY_VALUE:securyty}
    server.tomcat.accesslog.enabled=${TOMCAT_ACCESSLOG_ENABLED:false}
    server.tomcat.accesslog.pattern=%h %l %u %t "%r" %s %b %D
    # default current work dir
    server.tomcat.basedir=
    ## spring security config
    ### turn off security

nacos.security.ignore.urls=${NACOS_SECURITY_IGNORE_URLS:,/error,/**/*
.css,/**/*.js,/**/*.html,/**/*.map,/**/*.svg,/**/*.png,/**/*.ico,/cons
ole-
fe/public/**,/v1/auth/**,/v1/console/health/**,/actuator/**,/v1/consol
e/server/**}
    # metrics for elastic search
    management.metrics.export.elastic.enabled=false
    management.metrics.export.influx.enabled=false

nacos.naming.distro.taskDispatchThreadCount=10
nacos.naming.distro.taskDispatchPeriod=200
nacos.naming.distro.batchSyncKeyCount=1000
nacos.naming.distro.initDataRatio=0.9
nacos.naming.distro.syncRetryDelay=5000
nacos.naming.data.warmup=true
```
})
# config.save()
# config.debug()

statefulSet = StatefulSet()
statefulSet = StatefulSet()
statefulSet.apiVersion('apps/v1')
statefulSet.metadata().name('nacos').labels(
    {'app': 'nacos'}).namespace(namespace)
statefulSet.spec().replicas(3)
statefulSet.spec().serviceName('nacos')
statefulSet.spec().selector({'matchLabels': {'app': 'nacos'}})
statefulSet.spec().template().metadata().labels({'app': 'nacos'})
statefulSet.spec().template().spec().containers().name('nacos').image(
    'nacos/nacos-server:latest').env([
        {'name': 'TZ', 'value': 'Asia/Shanghai'},
        {'name': 'LANG', 'value': 'en_US.UTF-8'},
        {'name': 'PREFER_HOST_MODE', 'value': 'hostname'},
        # {'name': 'MODE', 'value': 'standalone'},

        {'name': 'MODE', 'value': 'cluster'},
        {'name': 'NACOS_REPLICAS', 'value': '3'},
        {'name': 'NACOS_SERVERS', 'value': 'nacos-
0.nacos.default.svc.cluster.local:8848 nacos-
1.nacos.default.svc.cluster.local:8848 nacos-
2.nacos.default.svc.cluster.local:8848'},

```

```

        {'name': 'SPRING_DATASOURCE_PLATFORM', 'value': 'mysql'},
        {'name': 'MYSQL_SERVICE_HOST', 'value': 'mysql-
0.mysql.default.svc.cluster.local'},
        {'name': 'MYSQL_SERVICE_PORT', 'value': '3306'},
        {'name': 'MYSQL_SERVICE_DB_NAME', 'value': 'nacos'},
        {'name': 'MYSQL_SERVICE_USER', 'value': 'nacos'},
        {'name': 'MYSQL_SERVICE_PASSWORD', 'value': 'nacos'},
        {'name': 'MYSQL_SERVICE_DB_PARAM', 'value':
'characterEncoding=utf8&connectTimeout=1000&socketTimeout=3000&autoReconnect=true&useSSL=false&serverTimezone=Asia/Shanghai'},
        {'name': 'JVM_XMX', 'value': '4g'},
        {'name': 'NACOS_DEBUG', 'value': 'true'},
        {'name': 'TOMCAT_ACCESSLOG_ENABLED', 'value': 'true'},
    ]).ports([
        {'containerPort': 8848},
        {'containerPort': 9848},
        {'containerPort': 9555}
    ]).volumeMounts([
        {'name': 'config', 'mountPath':
'/home/nacos/conf/custom.properties', 'subPath': 'custom.properties'},
        # {'name': 'config', 'mountPath':
'/home/nacos/conf/application.properties', 'subPath':
'application.properties'}
    ]).resources({'limits': {'memory': "4Gi"}, 'requests': {'memory':
"2Gi"}})
# statefulSet.spec().template().spec().securityContext({'sysctls':
[{'name': 'fs.file-max', 'value': '60000'}]})
statefulSet.spec().template().spec().volumes().name(
    'config').configMap({'name': 'nacos'})
statefulSet.debug()
# statefulSet.json()

service = Service()
service.metadata().name('nacos')
service.metadata().namespace(namespace)
service.spec().selector({'app': 'nacos'})
service.spec().type('ClusterIP')
service.spec().ports([
    {'name': 'http', 'protocol': 'TCP', 'port': 8848, 'targetPort':
8848},
    {'name': 'rpc', 'protocol': 'TCP', 'port': 9848, 'targetPort':
9848},
    # {'name': 'http', 'protocol': 'TCP', 'port': 9555, 'targetPort':
9555}
])

print("=" * 40, "Compose", "=" * 40)
compose = Compose('development')
# compose.add(namespace)

```

```

compose.add(config)
compose.add(statefulSet)
compose.add(service)
# compose.debug()
compose.save()
compose.delete()
compose.create()

print("=" * 40, "Busybox", "=" * 40)
os.system("sleep 5")
for cmd in ['kubectl get secret tls', 'kubectl get configmap',
'kubectl get pods', 'kubectl get service', 'kubectl get statefulset',
'kubectl get ingress']:
    os.system(cmd)
    print("-" * 50)

```

## Ingress 部署

```

ingress = Ingress()
ingress.apiVersion('networking.k8s.io/v1')
ingress.metadata().name('nginx')
ingress.metadata().namespace(namespace)
ingress.metadata().annotations({'ingress.kubernetes.io/ssl-redirect':
"true"})
ingress.spec().tls(
[{'hosts': ['www.netkiller.cn',
'job.netkiller.cn','admin.netkiller.cn','nacos.netkiller.cn','test.net
killer.cn','cloud.netkiller.cn'], 'secretName':'tls'}])
ingress.spec().rules([
{
    'host': 'www.netkiller.cn',
    'http': {
        'paths': [
            {
                'path': '/',
                'pathType': 'Prefix',
                'backend': {
                    'service': {
                        'name': 'nginx',
                        'port': {
                            'number': 80
                        }
                    }
                }
            }
        ]
    }
}])

```

```

        },
    },
    {
        'host': 'nacos.netkiller.cn',
        'http': {
            'paths': [
                {
                    'path': '/',
                    'pathType': 'Prefix',
                    'backend': {
                        'service': {
                            'name': 'nacos',
                            'port': {
                                'number': 8848
                            }
                        }
                    }
                }
            ]
        },
    },
])

```

测试地址 <https://nacos.netkiller.cn/nacos/>

### 3.12. Redis

```

import sys, os

sys.path.insert(0, '/Users/neo/workspace/devops')
from netkiller.kubernetes import *

namespace = 'default'

config = ConfigMap('redis')
config.apiVersion('v1')
config.metadata().name('redis').namespace(namespace)
# config.from_file('redis.conf', 'redis.conf')
config.data({
    'redis.conf':
    pss('''\
    pidfile /var/lib/redis/redis.pid
    dir /data
    port 6379
    bind 0.0.0.0
    appendonly yes
    protected-mode yes
    ''')
})

```

```
    requirepass passw0rd
    maxmemory 2mb
    maxmemory-policy allkeys-lru
  ''')
})

# config.debug()

persistentVolumeClaim = PersistentVolumeClaim()
persistentVolumeClaim.metadata().name('redis')
# persistentVolumeClaim.metadata().labels({'app': 'redis', 'type': 'longhorn'})
# persistentVolumeClaim.spec().storageClassName('longhorn')
persistentVolumeClaim.spec().storageClassName('local-path')
persistentVolumeClaim.spec().accessModes(['ReadWriteOnce'])
persistentVolumeClaim.spec().resources({'requests': {'storage': '2Gi'}})

limits = {
    'limits': {
        'cpu': '200m',
        'memory': '2Gi'
    },
    'requests': {
        'cpu': '200m',
        'memory': '1Gi'
    }
}

livenessProbe = {
    'tcpSocket': {
        'port': 6379
    },
    'initialDelaySeconds': 30,
    'failureThreshold': 3,
    'periodSeconds': 10,
    'successThreshold': 1,
    'timeoutSeconds': 5
}
readinessProbe = {
    'tcpSocket': {
        'port': 6379
    },
    'initialDelaySeconds': 5,
    'failureThreshold': 3,
    'periodSeconds': 10,
    'successThreshold': 1,
    'timeoutSeconds': 5
}

statefulSet = StatefulSet()
```

```

statefulSet.metadata().name('redis').labels({'app': 'redis'})
statefulSet.spec().replicas(1)
statefulSet.spec().serviceName('redis')
statefulSet.spec().selector({'matchLabels': {'app': 'redis'}})
statefulSet.spec().template().metadata().labels({'app': 'redis'})
# statefulSet.spec().template().spec().nodeName('master')
statefulSet.spec().template().spec().containers(
).name('redis').image('redis:latest').ports([
    'containerPort': 6379
}).volumeMounts([
{
    'name': 'data',
    'mountPath': '/data'
},
{
    'name': 'config',
    'mountPath': '/usr/local/etc/redis.conf',
    'subPath': 'redis.conf'
},
]).resources(None).livenessProbe(livenessProbe).readinessProbe(readinessProbe)
# .command("sh -c redis-server /usr/local/etc/redis.conf")
statefulSet.spec().template().spec().volumes([
{
    'name': 'data',
    'persistentVolumeClaim': {
        'claimName': 'redis'
    }
}, {
    'name': 'config',
    'configMap': {
        'name': 'redis'
    }
}
])
# statefulSet.spec().volumeClaimTemplates([
#     {
#         'metadata': {'name': 'data'},
#         'spec': {
#             'accessModes': [ "ReadWriteOnce" ],
#             'storageClassName': "local-path",
#             'resources': {'requests': {'storage': '2Gi'}}
#         }
#     }
# ])
service = Service()
service.metadata().name('redis')
service.metadata().namespace(namespace)
service.spec().selector({'app': 'redis'})
service.spec().type('NodePort')
service.spec().ports([
    {
        'name': 'redis',
        'protocol': 'TCP',
    }
])

```

```

        'port': 6379,
        'targetPort': 6379
    })
# service.debug()

compose = Compose('development')
compose.add(config)
compose.add(persistentVolumeClaim)
compose.add(statefulSet)
compose.add(service)
# compose.debug()

# kubeconfig = '/Volumes/Data/kubernetes/test'
kubeconfig = os.path.expanduser('~/workspace/ops/k3s.yaml')

kubernetes = Kubernetes(kubeconfig)
kubernetes.compose(compose)
kubernetes.main()

```

### 3.13. Kubernetes 部署 kube-explorer 图形化界面

```

import os
import sys
import time

sys.path.insert(0, '/Users/neo/workspace/devops')

from netkiller.kubernetes import *

namespace = 'default'
name = 'kube-explorer'
labels = {'app': name}
annotations = {}
replicas = 1
containerPort = 80
image = 'cnrancher/kube-explorer:latest'
monitor = '/dashboard'
livenessProbe = {}
readinessProbe = {}
limits = {}

compose = Compose('test', 'k3s.yaml')

config = ConfigMap()
config.metadata().name(name).namespace(namespace)

```

```

config.from_file('k3s.yaml', 'k3s.yaml')
compose.add(config)

deployment = Deployment()
deployment.metadata().name(name).labels(labels).namespace(namespace)
deployment.metadata().annotations(annotations)
deployment.spec().replicas(replicas)
deployment.spec().progressDeadlineSeconds(10)
deployment.spec().revisionHistoryLimit(10)
deployment.spec().selector({'matchLabels': {'app': name}})
# deployment.spec().strategy().type('RollingUpdate').rollingUpdate(1,
0)
deployment.spec().template().metadata().labels({'app': name})

livenessProbe = {
    'failureThreshold': 3,
    'httpGet': {
        'path': monitor,
        'port': containerPort,
        'scheme': 'HTTP'
    },
    'initialDelaySeconds': 60,
    'periodSeconds': 10,
    'successThreshold': 1,
    'timeoutSeconds': 5
}
readinessProbe = {
    'failureThreshold': 3,
    'httpGet': {
        'path': monitor,
        'port': containerPort,
        'scheme': 'HTTP'
    },
    'initialDelaySeconds': 30,
    'periodSeconds': 10,
    'successThreshold': 1,
    'timeoutSeconds': 5
}

# limits = {'limits': {
#     '# 'cpu': '500m',
#     'memory': '1Gi'}, 'requests': {
#         '# 'cpu': '500m',
#         'memory': '1Gi'}}

deployment.spec().template().spec().containers().name(name).image(image)
.deployment.spec().template().spec().containers().name(name).image(image)
.ports([
    {
        'containerPort': containerPort
    }]).imagePullPolicy('IfNotPresent').volumeMounts([
    {

```

```

        'name': 'config',
        'mountPath': '/etc/rancher/k3s/k3s.yaml',
        'subPath': 'k3s.yaml'
    },
]).resources(limits).livenessProbe(livenessProbe).readinessProbe(
    readinessProbe).env([
        # {
        #     'name': 'CONTEXT',
        #     'value': '/dashboard'
        # },
        {
            'name': 'KUBECONFIG',
            'value': '/etc/rancher/k3s/k3s.yaml'
        },
]).command([
    'kube-explorer', '--kubeconfig=/etc/rancher/k3s/k3s.yaml',
    '--http-listen-port=80', '--https-listen-port=0'
])
# , '--ui-path=/dashboard'
# --context value           [$CONTEXT]
deployment.spec().template().spec().restartPolicy(Define.restartPolicy
    .Always)
# deployment.spec().template().spec().nodeSelector({'group':
    'backup'})
#
deployment.spec().template().spec().dnsPolicy(Define.dnsPolicy.Cluster
First)
deployment.spec().template().spec().volumes([
    {
        'name': 'config',
        'configMap': {
            'name': name
        }
    }
])
compose.add(deployment)

service = Service()
service.metadata().namespace(namespace)
service.spec().selector({'app': name})
service.metadata().name(name)
service.spec().type(Define.Service.ClusterIP)
service.spec().ports({
    'name': 'http',
    'protocol': 'TCP',
    'port': 80,
    'targetPort': containerPort
})
compose.add(service)

ingress = Ingress()
ingress.apiVersion('networking.k8s.io/v1')
ingress.metadata().name(name)

```

```
ingress.metadata().namespace(namespace)
# ingress.metadata().annotations({'kubernetes.io/ingress.class':
'nginx'})
pathType = Define.Ingress.pathType.Prefix

ingress.spec().rules([
    # 'host': vhost['host'],
    'http': {
        'paths': [
            {
                'path': '/dashboard/',
                'pathType': pathType,
                'backend': {
                    'service': {
                        'name': name,
                        'port': {
                            'number': 80
                        }
                    }
                }
            },
            {
                'path': '/v1/',
                'pathType': pathType,
                'backend': {
                    'service': {
                        'name': name,
                        'port': {
                            'number': 80
                        }
                    }
                }
            },
            {
                'path': '/k8s/',
                'pathType': pathType,
                'backend': {
                    'service': {
                        'name': name,
                        'port': {
                            'number': 80
                        }
                    }
                }
            },
            {
                'path': '/apis/',
                'pathType': pathType,
                'backend': {
                    'service': {
                        'name': name,
                        'port': {
                            'number': 80
                        }
                    }
                }
            }
        ]
    }
])
```

```

        }
    },
    {
        'path': '/api/',
        'pathType': pathType,
        'backend': {
            'service': {
                'name': name,
                'port': {
                    'number': 80
                }
            }
        }
    }
])
})
```
compose.add(ingress)

kubernetes = Kubernetes()
kubernetes.compose(compose)

# kubernetes.debug()
# kubernetes.environment({'test': 'k3s.yaml', 'grey': 'grey.yaml'})
kubernetes.main()

```

## 3.14. ELK

### Elasticsearch

```

from doctest import master
import sys, os

sys.path.insert(0, '/Users/neo/workspace/devops')
from netkiller.kubernetes import *

# https://blog.csdn.net/weihua831/article/details/126172591
# https://www.jianshu.com/p/05c93cf45971

namespace = 'default'
# image = 'docker.elastic.co/elasticsearch/elasticsearch:8.4.1'
image = 'elasticsearch:8.4.1'

compose = Compose('development')

config = ConfigMap('elasticsearch')

```

```
config.apiVersion('v1')
config.metadata().name('elasticsearch').namespace(namespace).labels({
    'app':
    'elasticsearch',
    'role':
    'master'
})
# config.from_file('redis.conf', 'redis.conf')
config.data({
    'elasticsearch.yml':
    pss(''')
cluster.name: kubernetes-cluster
node.name: ${HOSTNAME}
discovery.seed_hosts:
    - elasticsearch-master-0
cluster.initial_master_nodes:
    - elasticsearch-master-0.elasticsearch.default.svc.cluster.local
    - elasticsearch-data-0.elasticsearch-data.default.svc.cluster.local
    - elasticsearch-data-1.elasticsearch-data.default.svc.cluster.local
    - elasticsearch-data-2.elasticsearch-data.default.svc.cluster.local

network.host: 0.0.0.0
transport.profiles.default.port: 9300

xpack.security.enabled: false
xpack.monitoring.collection.enabled: true
'''')
})
config.debug()
compose.add(config)

service = Service()
service.metadata().name('elasticsearch')
service.metadata().namespace(namespace)
service.spec().selector({'app': 'elasticsearch', 'role': 'master'})
# service.spec().type('NodePort')
service.spec().ports([
    {'name': 'restful',
     'protocol': 'TCP',
     'port': 9200,
     'targetPort': 9200
}, {
    'name': 'transport',
    'protocol': 'TCP',
    'port': 9300,
    'targetPort': 9300
}])
# service.debug()
compose.add(service)

service = Service()
```

```
service.metadata().name('elasticsearch-data').labels({
    'app': 'elasticsearch',
    'role': 'data'
})
service.metadata().namespace(namespace)
service.spec().selector({'app': 'elasticsearch', 'role': 'data'})
# service.spec().type('NodePort')
service.spec().ports([
    # {'name': 'restful', 'protocol': 'TCP', 'port': 9200, 'targetPort': 9200},
    {
        'name': 'transport',
        'protocol': 'TCP',
        'port': 9300,
        'targetPort': 9300
    }
])
# service.debug()
compose.add(service)

limits = {
    'limits': {
        # 'cpu': '500m',
        'memory': '1Gi'
    },
    'requests': {
        # 'cpu': '500m',
        'memory': '1Gi'
    }
}

env = [
    {
        'name': 'TZ',
        'value': 'Asia/Shanghai'
    },
    {
        'name': 'LANG',
        'value': 'en_US.UTF-8'
    },
    {
        'name': 'cluster.name',
        'value': 'kubernetes-cluster'
    },
    {
        'name': 'node.name',
        'valueFrom': {
            'fieldRef': {
                'fieldPath': 'metadata.name'
            }
        }
    }
]
```

```

},
{
  'name': 'cluster.initial_master_nodes',
  'value': 'elasticsearch-master-0,elasticsearch-master-1'
},
{
  'name':
  'discovery.seed_hosts',
  'value':
  'elasticsearch-master-
0.elasticsearch.default.svc.cluster.local,elasticsearch-data-
0.elasticsearch-data.default.svc.cluster.local,elasticsearch-data-
1.elasticsearch-data.default.svc.cluster.local,elasticsearch-data-
2.elasticsearch-data.default.svc.cluster.local'
},
{
  'name': 'xpack.security.enabled',
  'value': 'false'
},
{
  'name': 'ES_JAVA_OPTS',
  'value': '-Xms2048m -Xmx2048m'
},
{
  'name': 'RLIMIT_MEMLOCK',
  'value': 'unlimited'
},
]
]

deployment = StatefulSet()
deployment.metadata().name('elasticsearch-master').labels({
  'app': 'elasticsearch',
  'role': 'master'
}).annotations({
  # 'security.kubernetes.io/sysctls': 'vm.swappiness=0',
  'security.kubernetes.io/sysctls': 'vm.max_map_count=262144',
  # 'security.kubernetes.io/sysctls': 'vm.overcommit_memory=1'
})
deployment.spec().replicas(2).revisionHistoryLimit(10)
deployment.spec().serviceName('elasticsearch')
deployment.spec().selector(
  {'matchLabels': {
    'app': 'elasticsearch',
    'role': 'master'
 }})
deployment.spec().template().metadata().labels({
  'app': 'elasticsearch',
  'role': 'master'
})
deployment.spec().template().spec().initContainers(
).name('sysctl').image(image).imagePullPolicy('IfNotPresent').securityCo

```

```

ntext({
    'privileged':
    True,
    'runAsUser':
    0
}).command([
    "/bin/bash",
    "-c",
    "sysctl -w vm.max_map_count=262144 -w vm.swappiness=0 -w
vm.overcommit_memory=1",
])
deployment.spec().template().spec().containers()
.name('elasticsearch-master').image(image).resources(None).ports([
{
    'name': 'restful',
    'protocol': 'TCP',
    'containerPort': 9200
},
{
    'name': 'transport',
    'protocol': 'TCP',
    'containerPort': 9300
},
])
.volumeMounts([
#
#   {
#       'name': 'config',
#       'mountPath':
'/usr/share/elasticsearch/config/elasticsearch.yml',
#       'subPath': 'elasticsearch.yml'
#   },
{
    'name': 'elasticsearch',
    'mountPath': '/usr/share/elasticsearch/data'
}
]).env(env).securityContext({'privileged': True})
deployment.spec().template().spec().volumes([
{
    'name': 'config',
    'configMap': {
        'name': 'elasticsearch'
    }
}, {
    'name': 'elasticsearch',
    'emptyDir': {}
}])
# deployment.debug()
compose.add(deployment)

livenessProbe = {
    'tcpSocket': {
        'port': 9300
    },

```

```
'initialDelaySeconds': 60,
'failureThreshold': 3,
'periodSeconds': 10,
'successThreshold': 1,
'timeoutSeconds': 5
}
readinessProbe = {
    'tcpSocket': {
        'port': 9300
    },
    'initialDelaySeconds': 5,
    'failureThreshold': 3,
    'periodSeconds': 10,
    'successThreshold': 1,
    'timeoutSeconds': 5
}

statefulSet = StatefulSet()
statefulSet.metadata().name('elasticsearch-data').labels({
    'app': 'elasticsearch',
    'role': 'data'
}).annotations({
    # 'security.kubernetes.io/sysctls': 'vm.swappiness=0',
    'security.kubernetes.io/sysctls': 'vm.max_map_count=262144',
    # 'security.kubernetes.io/sysctls': 'vm.overcommit_memory=1'
})
statefulSet.spec().replicas(3).revisionHistoryLimit(10)
statefulSet.spec().serviceName('elasticsearch-data')
statefulSet.spec().selector(
    {'matchLabels': {
        'app': 'elasticsearch',
        'role': 'data'
    }})
statefulSet.spec().template().metadata().labels({
    'app': 'elasticsearch',
    'role': 'data'
})
statefulSet.spec().template().spec().initContainers(
).name('sysctl').image(image).imagePullPolicy('IfNotPresent').securityContext({
    'privileged':
    True,
    'runAsUser':
    0
}).command([
    "/bin/bash",
    "-c",
    "sysctl -w vm.max_map_count=262144 -w vm.swappiness=0 -w vm.overcommit_memory=1",
])
statefulSet.spec().template().spec().containers(
```

```

).name('elasticsearch-data').image(image).ports([
    # {'name': 'restful', 'protocol': 'TCP', 'containerPort': 9200},
    {
        'name': 'transport',
        'protocol': 'TCP',
        'containerPort': 9300
    }
]).volumeMounts([
#     {
#         'name': 'config',
#         'mountPath': '/usr/share/elasticsearch/config/elasticsearch.yml',
#         'subPath': 'elasticsearch.yml'
#     },
{
    'name': 'elasticsearch',
    'mountPath': '/usr/share/elasticsearch/data'
}]).env(env).securityContext({
    'privileged': True
}).resources(None).livenessProbe(livenessProbe).readinessProbe(readiness
Probe)
statefulSet.spec().template().spec().volumes([
{
    'name': 'config',
    'configMap': {
        'name': 'elasticsearch'
    }
}
])
#
statefulSet.spec().volumeClaimTemplates('a').metadata().name('elastice
rch')
#
statefulSet.spec().volumeClaimTemplates('a').spec().resources({'reque
sts': {'storage':
'1Gi'}}).accessModes(['ReadWriteOnce']).storageClassName('local-path')
statefulSet.spec().volumeClaimTemplates([
{
    'metadata': {
        'name': 'elasticsearch'
    },
    'spec': {
        'accessModes': ["ReadWriteOnce"],
        #   'storageClassName': "longhorn-storage",
        'storageClassName': "local-path",
        'resources': {
            'requests': {
                'storage': '100Gi'
            }
        }
    }
}])
# statefulSet.debug()

```

```

compose.add(statefulSet)

ingress = Ingress()
ingress.apiVersion('networking.k8s.io/v1')
ingress.metadata().name('elasticsearch').labels({
    'app': 'elasticsearch',
    'role': 'master'
})
ingress.metadata().namespace(namespace)
# ingress.metadata().annotations({'kubernetes.io/ingress.class':
'nginx'})
ingress.spec().rules([
    {
        'host': 'es.netkiller.cn',
        'http': {
            'paths': [
                {
                    'pathType': Define.Ingress.pathType.Prefix,
                    'path': '/',
                    'backend': {
                        'service': {
                            'name': 'elasticsearch',
                            'port': {
                                'number': 9200
                            }
                        }
                    }
                }
            ]
        }
    }
])
# ingress.debug()
compose.add(ingress)
# compose.debug()

# kubeconfig = '/Volumes/Data/kubernetes/test'
# kubeconfig = os.path.expanduser('~/workspace/opsk3d-test.yaml')
kubeconfig = os.path.expanduser('~/workspace/ops/ensd/k3s.yaml')

kubernetes = Kubernetes(kubeconfig)
kubernetes.compose(compose)
kubernetes.main()

```

## Kibana

```

import sys, os

sys.path.insert(0, '/Users/neo/workspace/devops')
from netkiller.kubernetes import *

```

```
namespace = 'default'

config = ConfigMap('kibana')
config.apiVersion('v1')
config.metadata().name('kibana').namespace(namespace)
# config.from_file('redis.conf', 'redis.conf')
config.data({
    'kibana.yml':
        pss('''\nserver.name: kibana\nserver.host: "0"\nserver.basePath: "/kibana"\nmonitoring.ui.container.elasticsearch.enabled: true\nxpack.security.enabled: true\nelasticsearch.hosts: [ "http://elasticsearch:9200" ]\nelasticsearch.username: elastic\nelasticsearch.password: I3KEj0MhUmGxKyd510MhUmGxKydSt\n''')
})

limits = {
    'limits': {
        'cpu': '200m',
        'memory': '2Gi'
    },
    'requests': {
        'cpu': '200m',
        'memory': '1Gi'
    }
}

livenessProbe = {
    'tcpSocket': {
        'port': 6379
    },
    'initialDelaySeconds': 30,
    'failureThreshold': 3,
    'periodSeconds': 10,
    'successThreshold': 1,
    'timeoutSeconds': 5
}
readinessProbe = {
    'tcpSocket': {
        'port': 6379
    },
    'initialDelaySeconds': 5,
    'failureThreshold': 3,
    'periodSeconds': 10,
    'successThreshold': 1,
    'timeoutSeconds': 5
}
```

```

}

deployment = Deployment()
deployment.metadata().name('kibana').labels({
    'app': 'kibana'
}).namespace(namespace)
deployment.spec().replicas(1)
deployment.spec().revisionHistoryLimit(10)
# deployment.spec().serviceName('redis')
deployment.spec().selector({'matchLabels': {'app': 'kibana'}})
deployment.spec().strategy().type('RollingUpdate').rollingUpdate('25%', '25%')
deployment.spec().template().metadata().labels({'app': 'kibana'})
deployment.spec().template().spec().containers().name('kibana').image(
    'kibana:8.4.1').ports([
        {
            'name': 'http',
            'containerPort': 5601,
            'protocol': 'TCP'
        }])
.deployment.spec().template().spec().env([
    {
        'name': 'TZ',
        'value': 'Asia/Shanghai'
    },
    {
        'name': 'ELASTICSEARCH_HOSTS',
        'value':
'http://elasticsearch.default.svc.cluster.local:9200'
    },
])
.deployment.spec().template().spec().tolerations([
{
    'key': 'node-role.kubernetes.io/master',
    'effect': 'NoSchedule'
}])
# .volumeMounts([
# {
#     'name': 'config',
#     'mountPath': '/usr/share/kibana/config/kibana.yml',
#     'subPath': 'kibana.yml'
# },
# ])
#
.resources(None).livenessProbe(livenessProbe).readinessProbe(readinessProbe)

# deployment.spec().template().spec().volumes([
#     {
#         'name': 'config',
#         'configMap': {
#             'name': 'kibana'
#         }
#     }])

```

```
service = Service()
service.metadata().name('kibana')
service.metadata().namespace(namespace)
service.spec().selector({'app': 'kibana'})
service.spec().type('ClusterIP')
service.spec().ports([
    {'name': 'http',
     'protocol': 'TCP',
     'port': 80,
     'targetPort': 5601
   }])
# service.debug()

ingress = Ingress()
ingress.apiVersion('networking.k8s.io/v1')
ingress.metadata().name('kibana').labels({
    'app': 'kibana',
})
ingress.metadata().namespace(namespace)
# ingress.metadata().annotations({'kubernetes.io/ingress.class':
'nginx'})
ingress.spec().rules([
    {
        'host': 'kibana.netkiller.cn',
        'http': {
            'paths': [
                {
                    'pathType': Define.Ingress.pathType.Prefix,
                    'path': '/',
                    'backend': {
                        'service': {
                            'name': 'kibana',
                            'port': {
                                'number': 80
                            }
                        }
                    }
                }
            ]
        }
    }
])
compose = Compose('development')
compose.add(config)
compose.add(deployment)
compose.add(service)
compose.add(ingress)
# compose.debug()

# kubeconfig = '/Volumes/Data/kubernetes/test'
kubeconfig = os.path.expanduser('~/workspace/ops/ensd/k3s.yaml')
```

```
kubernetes = Kubernetes(kubeconfig)
kubernetes.compose(compose)
kubernetes.main()
```

## 验证是否工作正常

```
neo@MacBook-Pro-Neo ~> curl -s -X GET
"http://es.netkiller.cn/_cat/nodes?v=true&pretty"
ip           heap.percent ram.percent cpu load_1m load_5m load_15m
node.role    master name
10.42.2.95      24        19   0    3.79    1.89    0.84
cdfhilmrstw -  elasticsearch-data-2
10.42.1.221      19        20   0    0.03    0.13    0.21
cdfhilmrstw -  elasticsearch-data-0
10.42.0.186      20        41   0    0.01    0.14    0.19
cdfhilmrstw -  elasticsearch-data-1
10.42.2.94       21        19   0    3.79    1.89    0.84
cdfhilmrstw -  elasticsearch-master-0
10.42.1.220      34        20   0    0.03    0.13    0.21
cdfhilmrstw *  elasticsearch-master-1
```

```
neo@MacBook-Pro-Neo ~> curl -s -X GET
"http://es.netkiller.cn/_cat/health?v&pretty"
epoch      timestamp cluster          status node.total node.data
shards pri relo init unassign pending_tasks max_task_wait_time
active_shards_percent
1662963543 06:19:03 kubernetes-cluster green      5      5
8   4   0   0       0           0
100.0%
```

## 3.15. sonarqube

```
import sys, os

sys.path.insert(0, '/Users/neo/workspace/GitHub/devops')
from netkiller.kubernetes import *
```

```

namespace = 'default'

service = Service()
service.metadata().name('sonarqube')
service.metadata().namespace(namespace)
service.spec().selector({'app': 'sonarqube'})
service.spec().type('NodePort')
service.spec().ports([
    {'name': 'sonarqube',
     'protocol': 'TCP',
     'port': 80,
     'targetPort': 9000
   }])
# service.debug()

# persistentVolumeClaim = PersistentVolumeClaim()
# persistentVolumeClaim.metadata().name('sonarqube')
# persistentVolumeClaim.metadata().namespace(namespace)
# persistentVolumeClaim.metadata().labels({'app': 'sonarqube', 'type':
'longhorn'})
# persistentVolumeClaim.spec().storageClassName('longhorn')
# persistentVolumeClaim.spec().accessModes(['ReadWriteOnce'])
# persistentVolumeClaim.spec().resources({'requests': {'storage':
'2Gi'}})

statefulSet = StatefulSet()
statefulSet.metadata().namespace(namespace)
statefulSet.metadata().name('sonarqube').labels({'app': 'sonarqube'})
statefulSet.spec().replicas(1)
statefulSet.spec().serviceName('sonarqube')
statefulSet.spec().selector({'matchLabels': {'app': 'sonarqube'}})
statefulSet.spec().template().metadata().labels({'app': 'sonarqube'})
# statefulSet.spec().template().spec().nodeName('master')

statefulSet.spec().template().spec().containers(
).name('postgresql').image('postgres:latest').ports([
    {'containerPort': 5432
}]).env([
    {'name': 'TZ', 'value': 'Asia/Shanghai'},
    {'name': 'LANG', 'value': 'en_US.UTF-8'},
    {'name': 'POSTGRES_USER', 'value': 'sonar'},
    {'name': 'POSTGRES_PASSWORD', 'value': 'sonar'}
]).volumeMounts([
    {
        'name': 'postgresql',
        'mountPath': '/var/lib/postgresql'
    },
    {
        'name': 'postgresql',
        'mountPath': '/var/lib/postgresql/data',
        'subPath' : 'data'
    }
])

```

```
        },
    ])

statefulSet.spec().template().spec().containers()
    .name('sonarqube').image('sonarqube:community').ports([
        'containerPort': 9000
    ]).env([
        {'name': 'TZ', 'value': 'Asia/Shanghai'},
        {'name': 'LANG', 'value': 'en_US.UTF-8'},
        {'name': 'SONAR_JDBC_URL', 'value':
            'jdbc:postgresql://localhost:5432/sonar'},
        {'name': 'SONAR_JDBC_USERNAME', 'value': 'sonar'},
        {'name': 'SONAR_JDBC_PASSWORD', 'value': 'sonar'}
    ]).resources(
    # {
    #     'limits': {
    #         'cpu': '500m',
    #         'memory': '2Gi'
    #     },
    #     'requests': {
    #         'cpu': '500m',
    #         'memory': '2Gi'
    #     }
    # }
).livenessProbe(
    {
        'httpGet': {
            'port': 9000,
            'path': '/'
        },
        'initialDelaySeconds': 30,
        'failureThreshold': 3,
        'periodSeconds': 10,
        'successThreshold': 1,
        'timeoutSeconds': 5
    }
).readinessProbe(
    {
        'httpGet': {
            'port': 9000,
            'path': '/'
        },
        'initialDelaySeconds': 5,
        'failureThreshold': 3,
        'periodSeconds': 10,
        'successThreshold': 1,
        'timeoutSeconds': 5
    }
).volumeMounts([
    {
        'name': 'sonarqube',
```

```

        'mountPath': '/opt/sonarqube/data',
        'subPath' : 'data'
    },
    {
        'name': 'sonarqube',
        'mountPath': '/opt/sonarqube/extensions',
        'subPath' : 'extensions'
    },
])
.statefulSet.spec().template().spec().volumes([
    {
        'name': 'sonarqube',
        'persistentVolumeClaim': {
            'claimName': 'sonarqube'
        }
    },
    {
        'name': 'postgresql',
        'persistentVolumeClaim': {
            'claimName': 'postgresql'
        }
    }
])
.statefulSet.spec().volumeClaimTemplates([
    {
        'metadata': {'name': 'sonarqube'},
        'spec': {
            'accessModes': [ "ReadWriteOnce" ],
            'storageClassName': "local-path",
            'resources': {'requests': {'storage': '2Gi'}}
        }
    },
    {
        'metadata': {'name': 'postgresql'},
        'spec': {
            'accessModes': [ "ReadWriteOnce" ],
            'storageClassName': "local-path",
            'resources': {'requests': {'storage': '2Gi'}}
        }
    }
])
.ingress = Ingress()
ingress.apiVersion('networking.k8s.io/v1')
ingress.metadata().name('sonarqube')
ingress.metadata().namespace(namespace)
# ingress.metadata().annotations({'kubernetes.io/ingress.class':
'nginx'})
ingress.spec().rules([

```

```
{
    'host': 'sonarqube.netkiller.cn',
    'http':{
        'paths': [
            {
                'pathType': Define.Ingress.pathType.Prefix,
                'path': '/',
                'backend':{
                    'service':{
                        'name':'sonarqube',
                        'port': {'number': 80}
                    }
                }
            }
        ]
    }
}, {
    'http':{
        'paths': [
            {
                'pathType': Define.Ingress.pathType.Prefix,
                'path': '/sonarqube',
                'backend':{
                    'service':{
                        'name':'sonarqube',
                        'port': {'number': 80}
                    }
                }
            }
        ]
    }
}
])

compose = Compose('development')

# compose.add(persistentVolumeClaim)
compose.add(service)
compose.add(statefulSet)
compose.add(ingress)
# compose.debug()

kubeconfig = '/Users/neo/workspace/kubernetes/office.yaml'
# kubeconfig = os.path.expanduser('~/workspace/ops/k3s.yaml')

kubernetes = Kubernetes(kubeconfig)
kubernetes.compose(compose)
kubernetes.main()
```

# 第 12 章 Virtual Machine(虚拟机)

## 1. Kernel-based Virtual Machine(KVM)

<http://wiki.centos.org/HowTos/KVM>

### 1.1. kvm install usage yum

确认处理器是否支持KVM

```
egrep 'vmx|svm' /proc/cpuinfo
```

对当前系统做一个全面升级

```
sudo yum update  
sudo yum upgrade
```

Installing

如果你不想安装Virtualization组，想单独安装需要的软件，可是使用下面命令

```
# yum install qemu-kvm libvirt virt-install bridge-utils
```

确认kvm已经安装

**lsmod | grep kvm**

```
# lsmod | grep kvm  
kvm_intel           138567  0
```

```
kvm          441119  1 kvm_intel
```

Create the disk image

```
qemu-img create -f qcow2 disk.img 5G
```

or

```
dd if=/dev/zero of=disk.img bs=1G count=5
```

```
# qemu-img create -f qcow2 disk.img 5G
Formatting 'disk.img', fmt=qcow2, size=5242880 kB

# dd if=/dev/zero of=disk.img bs=1G count=5
5+0 records in
5+0 records out
5368709120 bytes (5.4 GB) copied, 61.0353 seconds, 88.0 MB/s
```

Creating a virtual machine

```
/usr/libexec/qemu-kvm -hda disk.img -cdrom archlinux-2009.08-
core-x86_64.iso -m 512 -boot d
```

如果你不在localhost上安装OS,你需要指定vnc,这样你可以远程连接到kvm

```
[root@scientific ~]# /usr/libexec/qemu-kvm disk.img -cdrom
rhel-server-5.6-x86_64-dvd.iso -m 8000 -boot d -vnc :1
```

```
[root@scientific ~]# yum install -y virt-manager virt-top virt-
v2v virt-viewer
or
[root@scientific ~]# yum groupinstall 'Virtualization'
```

## brctl / tunctl

```
[root@scientific ~]# yum install -y tunctl
```

### DHCP

```
brctl addbr br0
ifconfig eth0 0.0.0.0
brctl addif br0 eth0
dhclient br0
tunctl -b -u root
ifconfig tap0 up
brctl addif br0 tap0
```

### STATIC IP Address

```
brctl addbr br0
ifconfig eth0 0.0.0.0
brctl addif br0 eth0
ifconfig br0 up
tunctl -b -u root
ifconfig tap0 up
brctl addif br0 tap0

ifconfig br0 192.168.1.120 netmask 255.255.255.0 up
ip route add default via 192.168.3.1 dev br0
```

```
[root@scientific ~]# ip route
192.168.3.0/24 dev br0  proto kernel  scope link  src
192.168.3.43
192.168.3.0/24 dev tap0  proto kernel  scope link  src
192.168.3.21

default via 192.168.3.1 dev br0
[root@scientific ~]# brctl show
bridge name      bridge id               STP enabled

```

```
interfaces
br0          8000.4ea7e4cf4633      no           eth0
br06499     8000.000000000000      no           tap0
```

## 启动KVM

**指定网络参数 -net nic -net tap,ifname=tap0,script=no**

```
/usr/libexec/qemu-kvm -hda disk.img -m 8000 -net nic -net
tap,ifname=tap0,script=no -vnc :1

/usr/libexec/qemu-kvm -hda disk.img -m 8000 -net nic -net
tap,ifname=tap0,script=no -nographic -daemonize
```

## virt-install

```
yum install -y libvirt python-virtinst virt-manager
```

## 命令行安装

```
sudo virt-install --connect qemu:///system -n Ubuntu32 -r 512 -
--vcpus=1 -f /dev/sda3 -s 9 -c Desktop/ubuntu-10.10-desktop-
i386.iso --vnc --noautoconsole --os-type linux --os-variant
generic26 --accelerate --network=bridge:virbr0 --hvm
sudo virt-install --connect qemu:///system -n Ubuntu32 -r 512 -
--vcpus=1 -f ~/ubuntu32.qcow2 -s 12 -c esktop/ubuntu-10.10-
desktop-i386.iso --vnc --noautoconsole --os-type linux --os-
variant generic26 --accelerate --network=bridge:br0 --hvm
```

## 进入GUI工具

```
virsh -c qemu:///system list
```

```
sudo virt-manager
```

## 1.2. Ubuntu

确认你的CPU是否支持KVM

```
egrep '(vmx|svm)' -color=always /proc/cpuinfo
```

```
sudo apt-get install kvm libvirt-bin ubuntu-vm-builder bridge-utils kvm-pxe uml-utilities
```

```
kvm gui
```

```
sudo apt-get install ubuntu-virt-server ubuntu-virt-mgmt  
ubuntu-vm-builder python-vm-builder kvm-pxe
```

## 1.3. CentOS 6.2

```
# yum groupinstall Virtualization  
# yum groupinstall "Virtualization Client"  
# yum groupinstall "Virtualization Platform"  
  
# /etc/init.d/libvirtd start  
Starting libvirtd daemon:  
OK [
```

## 1.4. Scientific Linux Virtualization

```
[root@scientific ~]# yum groupinstall 'Virtualization'  
'Virtualization Client' 'Virtualization Platform'  
'Virtualization Tools'
```

## 1.5. libvirt

### virsh

```
$ sudo virsh -c qemu:///system list
 Id  Name           State
 -----
 1   Ubuntu         running
 2   Ubuntu-Server running

# virsh list
 Id    Name           State
 -----
 1     Ubuntu         running
 2     CentOS6.4     running
```

```
# virsh

显示虚拟机列表:
virsh # list --all

启动虚拟机:
virsh # start [name]

关闭虚拟机:
virsh # shutdown [name]

重启虚拟机:
virsh # reboot [name]

指定虚拟机开机自动启动:
virsh # autostart [name]
```

### 例 12.1. virsh

```
virsh # list --all
 Id    Name           State
 -----
```

```
-      CentOS6.4                      shut off
-      FreeBSD                       shut off
-      Test                           shut off
-      Ubuntu                         shut off
-      www                            shut off

virsh # start Ubuntu
Domain Ubuntu started

virsh # list --all
 Id   Name           State
-----
 1    Ubuntu          running
-    CentOS6.4        shut off
-    FreeBSD          shut off
-    Test             shut off
-    www              shut off

virsh # quit
```

### console

```
# virsh list
 Id   Name           State
-----
 2    monitor         running

# virsh console monitor
Connected to domain monitor
Escape character is ^]
```

Ctrl + ] 推出 console

### dumpxml

dump 虚拟机配置文件

```
virsh dumpxml Test
```

## Virtual Machine Manager

### 1.6. FAQ

#### No hypervisor options were found for this connection

Error: No hypervisor options were found for this connection

```
[root@r910 etc]# grep kvm /var/log/messages
Jun 21 15:28:05 r910 udevd[803]: specified group 'kvm' unknown
Jun 21 15:28:05 r910 udevd[803]: specified group 'kvm' unknown
Jun 21 15:28:07 r910 kernel: kvm: disabled by bios
Jun 21 15:28:07 r910 yum: Installed: 2:qemu-kvm-0.12.1.2-2.1
13.el6_0.8.x86_64
Jun 21 15:58:27 r910 kernel: kvm: disabled by bios
Jun 21 16:48:08 r910 kernel: kvm: disabled by bios
Jun 21 17:15:42 r910 yum: Erased: qemu-kvm
Jun 21 17:20:00 r910 kernel: kvm: disabled by bios
Jun 21 17:20:00 r910 yum: Installed: 2:qemu-kvm-0.12.1.2-2.1
13.el6_0.8.x86_64
```

进入BIOS启用虚拟化

如何判断当前服务器是实体机还是虚拟机

```
# lspci
00:00.0 Host bridge: Intel Corporation 440BX/ZX/DX -
82443BX/ZX/DX Host bridge (rev 01)
00:01.0 PCI bridge: Intel Corporation 440BX/ZX/DX -
82443BX/ZX/DX AGP bridge (rev 01)
00:07.0 ISA bridge: Intel Corporation 82371AB/EB/MB PIIIX4 ISA
(rev 08)
00:07.1 IDE interface: Intel Corporation 82371AB/EB/MB PIIIX4
```

```
| IDE (rev 01)
| 00:07.3 Bridge: Intel Corporation 82371AB/EB/MB PIIX4 ACPI (rev
| 08)
| 00:07.7 System peripheral: VMware Virtual Machine Communication
| Interface (rev 10)
| 00:0f.0 VGA compatible controller: VMware SVGA II Adapter
| 00:10.0 SCSI storage controller: LSI Logic / Symbios Logic
| 53c1030 PCI-X Fusion-MPT Dual Ultra320 SCSI (rev 01)
| 00:11.0 PCI bridge: VMware PCI bridge (rev 02)
| 00:15.0 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:15.1 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:15.2 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:15.3 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:15.4 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:15.5 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:15.6 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:15.7 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:16.0 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:16.1 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:16.2 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:16.3 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:16.4 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:16.5 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:16.6 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:16.7 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:17.0 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:17.1 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:17.2 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:17.3 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:17.4 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:17.5 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:17.6 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:17.7 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:18.0 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:18.1 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:18.2 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:18.3 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:18.4 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:18.5 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:18.6 PCI bridge: VMware PCI Express Root Port (rev 01)
| 00:18.7 PCI bridge: VMware PCI Express Root Port (rev 01)
| 03:00.0 Ethernet controller: VMware VMXNET3 Ethernet Controller
| (rev 01)
```

```
# dmesg | grep vm
kvm-clock: Using msrs 4b564d01 and 4b564d00
kvm-clock: cpu 0, msr 0:1c28841, boot clock
kvm-clock: cpu 0, msr 0:2216841, primary cpu clock
kvm-stealtime: cpu 0, msr 220e880
kvm-clock: cpu 1, msr 0:2316841, secondary cpu clock
kvm-stealtime: cpu 1, msr 230e880
sizeof(vma)=200 bytes
Switching to clocksource kvm-clock
```

## 2. Xen

## 2.1. install

create a virtual harddisk

```
[root@development ~]# mkdir /srv/vm/
[root@development ~]# dd if=/dev/zero of=/srv/vm/centos.img
bs=1M count=4096
4096+0 records in
4096+0 records out
4294967296 bytes (4.3 GB) copied, 49.2547 seconds, 87.2 MB/s
```

ubuntu

```
[root@development ~]# virt-install -n centos -r 256 -f /srv/vm/centos.img --nographics -l ftp://192.168.3.9/pub/
```

## 2.2. Manager

list

centos	6	127	1	-b-
---	74.3			

start

```
[root@development ~]# virsh start centos
Domain centos started
```

reboot

```
[root@development ~]# xm reboot centos
```

shutdown

```
[root@development ~]# xm shutdown centos
```

console

```
[root@development ~]# xm console centos
```

config

```
[root@development ~]# cat /etc/xen/centos
name = "centos"
uuid = "a6a3f200-bcbb-cdbd-c06e-9e71f739310f"
maxmem = 128
memory = 128
vcpus = 1
bootloader = "/usr/bin/pygrub"
on_poweroff = "destroy"
on_reboot = "restart"
on_crash = "restart"
disk = [ "tap:aio:/srv/vm/centos.img,xvda,w" ]
```

```
vif = [ "mac=00:16:36:5d:41:d0,bridge=xenbr0,script=vif-bridge"
]
```

## Automatically starting domains

```
[root@development ~]# mv /etc/xen/centos /etc/xen/auto
```

## 3. OpenVZ

### 3.1. 安装OpenVZ

过程 12.1. OpenVZ 安装步骤

#### 1. 获得OpenVZ yum安装源

```
# cd /etc/yum.repos.d  
# wget http://download.openvz.org/openvz.repo  
# rpm --import http://download.openvz.org/RPM-GPG-Key-  
OpenVZ
```

#### 2. 安装OpenVZ核心以及头文件

```
# yum install ovzkernel[-flavor]
```

#### 3. 修改启动所使用的内核为OpenVZ内核，使OpenVZ内核为默认启动内核

```
# vim /etc/grub.conf
```

将类似下面的内容

```
title Fedora Core (2.6.8-022stab029.1)  
      root (hd0,0)  
      kernel /vmlinuz-2.6.8-022stab029.1 ro root=/dev/sda5  
quiet rhgb vga=0x31B  
      initrd /initrd-2.6.8-022stab029.1.img
```

修改为类似这样

```
title OpenVZ (2.6.8-022stab029.1)
    root (hd0,0)
    kernel /vmlinuz-2.6.8-022stab029.1 ro
root=/dev/sda5
    initrd /initrd-2.6.8-022stab029.1.img
```

或直接在里面寻找类似开头为

```
title CentOS (2.6.18-194.3.1.el5.028stab069.6)
```

的项目，并且把default改为他的下标，下标从0开始

#### 4. 修改LINUX网络配置文件

```
/etc/sysctl.conf
# On Hardware Node we generally need
# packet forwarding enabled and proxy arp disabled
net.ipv4.ip_forward = 1 #修改

net.ipv6.conf.default.forwarding = 1 #添加
net.ipv6.conf.all.forwarding = 1 #添加
net.ipv4.conf.default.proxy_arp = 0 #添加

# Enables source route verification
net.ipv4.conf.all.rp_filter = 1 #修改

# Enables the magic-sysrq key
kernel.sysrq = 1 #修改

# We do not want all our interfaces to send redirects
net.ipv4.conf.default.send_redirects = 1 #添加
net.ipv4.conf.all.send_redirects = 0 #添加
```

#### 5. 关闭SELinux

```
# lokkit --selinux=disabled
```

```
SELINUX=disabled
```

## 6. 重启LINUX

```
# reboot
```

## 7. 安装OpenVZ管理工具

```
# yum install vzctl  
# yum install vzquota  
# yum install vzyum
```

用到什么工具就安装什么工具，具体可以使用# yum search vz\*搜索一下

## 8. 启动OpenVZ服务

```
# /sbin/service vz start
```

## 3.2. 使用OpenVZ & 建立VPS

由于VZ是半虚拟化的，所以VZ和VM不同的是VZ需要系统模板，而不是VM那样只需要一个ISO文件就可以安装

### 安装操作系统模板

#### 1. 搜索系统模板

```
# yum search vztmp1
```

## 2. 在搜索出来的结果中选用你想安装的操作系统

```
# yum install vztmp1-centos-4 -y
```

## 3. 为操作系统模板建立缓存

在我装的最小化CENTOS中，此步要下载很多包，需要很长时间完成

```
# vzpkgcache
```

该命令将建立centos-4-i386-minimal.tar.gz和centos-4-i386-default.tar.gz文件 或

```
# vzpkgcache centos-4-i386-minimal
```

建立 centos-4-i386-minimal.tar.gz

```
# vzpkgcache centos-4-i386-default
```

建立 centos-4-i386-default.tar.gz

出现Cache file centos-4-i386-default.tar.gz [120M] created.表示创建成功

**注意：本次步骤可能会出现如下错误**

```
cp: cannot stat `/etc/sysconfig/vz-scripts//ve-
```

```
vps.basic.conf-sample': No such file or directory  
ERROR: Can't copy VPS config
```

解决方法：进入/etc/sysconfig/vz-scripts/目录，将ve.basic.conf-sample 拷贝一份重命名为ve-vps.basic.conf-sample

查看系统中已经存在的操作系统缓存

```
# vzpkgls
```

## 创建OpenVZ操作系统节点（VPS）

### 1. 准备配置文件

平分主机系统资源（当然，如果你对配置文件的修改很熟悉也可以自己定制）

```
cd /etc/sysconfig/vz-scripts/  
vzsplit -n 3 -f vps.zenw.org
```

这样，系统资源就被平均分成了3分，并且产生了一个配置文件示例

### 2. 验证配置文件有效性

```
vzcfgvalidate ve-vps.zenw.org.conf-sample
```

### 3. 创建VPS节点

```
vzctl create 100 --ostemplate centos-4-i386-minimal --  
config vps.zenw.org
```

其中100是该节点的编号，可以自己定义

#### 4. 配置该VPS

```
设置VPS的hostname  
vzctl set 100 --hostname zenw.org --save  
设置VPS的ip  
vzctl set 100 --ipadd 192.168.xxx.xxx --save  
设置VPS的管理员帐号和密码  
vzctl set 100 --userpasswd root:xxxxxxxx  
设置VPS的DNS服务器  
vzctl set 100 --nameserver 8.8.8.8 --save  
设置VPS自启动  
vzctl set 100 --onboot yes --save  
启动VPS节点  
vzctl start 100  
执行VPS内部的命令（这里是开启VPS的ssh服务）  
vzctl exec 100 service sshd start  
加入VPS节点  
vzctl enter 100  
停止VPS节点  
vzctl stop 100
```

### 3.3. 设置VPS参数

#### 1. 修改VPS节点的配置文件

```
vim /etc/sysconfig/vz-scripts/100.conf  
在文件中添加或修改 DISK_QUOTA=no  
  
重启VPS节点  
vzctl restart 100  
查看当前磁盘大小  
vzctl exec 100 df  
设置磁盘大小  
vzctl set 100 --diskinodes 75000000:79000000 --save  
vzctl set 100 --quotatime 600 --save  
查看修改后的磁盘大小  
vzctl exec 100 df  
vzctl exec 100 stat -f /
```

```
vzctl set 100 --quotaugidlimit 100 --save  
vzctl restart 100  
  
vzctl exec 100 rpm -q quota  
  
vzyum 100 install quota  
  
vzquota stat 100 -t
```

## 2. 为VPS节点安装yum工具或其他工具

```
vzyum 100 install <软件名称>  
vzyum 100 install yum
```

另外,如果vzctl enter进入节点时出现错误, 或无法ssh节点, 需要运行以下命令: vzctl exec 112 "cd /dev; /sbin/MAKEDEV pty; /sbin/MAKEDEV tty; /sbin/MAKEDEV generic"

## **4. vagrant - Tool for building and distributing virtualized development environments**

<https://www.vagrantup.com/downloads.html>



### **4.1. vagrant for windows**



下一步



下一步



下一步



安装



下一步



完成



重启

## **5. 虚拟机管理**

**5.1. Proxmox - Open-source virtualization management platform Proxmox VE**

**5.2. OpenStack**

**5.3. CloudStack**

**5.4. OpenNode**

**5.5. OpenNEbula**