基于Helm和Operator的K8S应用管理

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K8S集群部署 ... done

应用容器化 ... done

deployment

RoleBinding

PersistentVolumeClaim

Role

ServiceAccount

Ingress

Secrets

Configmap

Service

Statefulset

如何做

- 应用资源的共享、存档、不同环境的配置管理
- 应用资源的生命周期管理

Kubernetes的包管理工具

应用包 == Charts

Charts

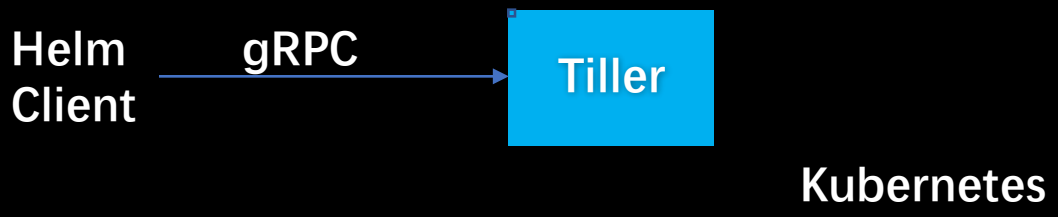
- 应用的定义描述
- 包括
  - Metadata
  - K8S 资源定义
  - 文档说明
- 存在chart仓库中

让我们用起来

```
$ helm init
```

Tiller

- 部署于K8S中的Helm服务端
- 帮助管理应用包的release
  - Release == Chart 的安装实例



```
$ helm install <chart>

# (stable/mariadb, ./nginx-1.2.3.tgz, ./nginx,
https://example.com/charts/nginx-1.2.3.tgz)

$ helm upgrade <release>

$ helm delete <release>
```

Chart的结构

$ helm create demoapp

```
demoapp/
├── Chart.yaml
├── charts
├── templates
└── values.yaml
```

模板-templates

```
demoapp/
├── Chart.yaml
├── charts
├── templates
│   ├── NOTES.txt
│   ├── _helpers.tpl
│   ├── deployment.yaml
│   ├── ingress.yaml
│   └── service.yaml
└── values.yaml
```

+

Go template

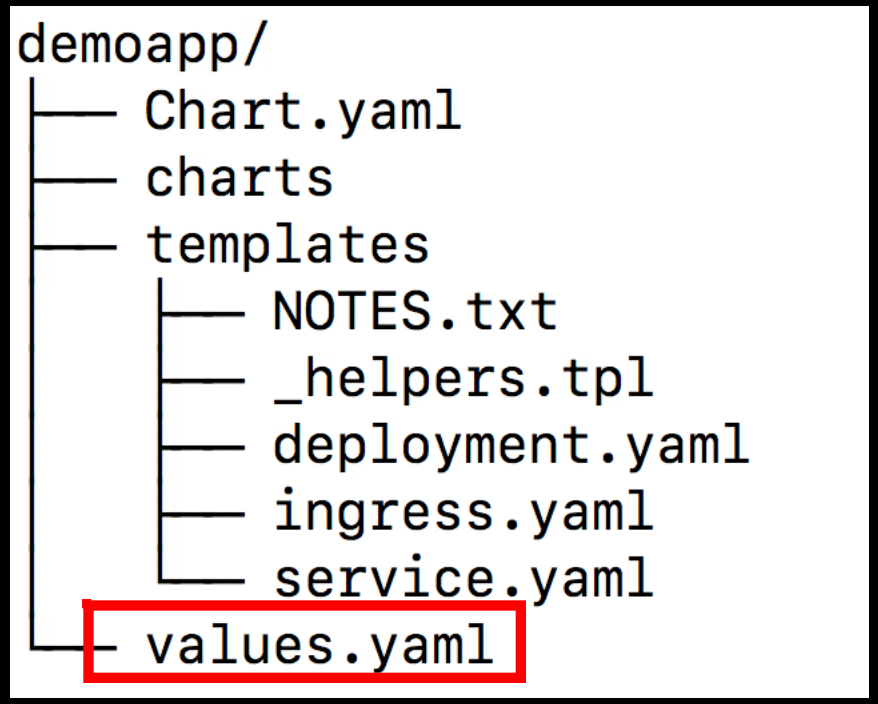
配置选项

```
demoapp/
├── Chart.yaml
├── charts
├── templates
│   ├── NOTES.txt
│   ├── _helpers.tpl
│   ├── deployment.yaml
│   ├── ingress.yaml
│   └── service.yaml
└── values.yaml
```

```
##### values.yaml
replicaCount: 1
image:
  repository: nginx
  tag: stable
  pullPolicy: IfNotPresent
...
```

```
##### deployment.yaml
apiVersion: extensions/v1beta1
kind: Deployment
metadata:
  #...
spec:
  replicas: {{ .Values.replicaCount }}
  template:
    #...
    spec:
      containers:
        - name: {{ .Chart.Name }}
          image: "{{ .Values.image.repository }}:{{ .Values.image.tag }}"
          imagePullPolicy: {{ .Values.image.pullPolicy }}
...
```

配置选项




```
##### values.yaml
replicaCount: 1
image:
  repository: nginx
  tag: stable
  pullPolicy: IfNotPresent
...
```

$ helm install --set image.tag=latest ./demoapp

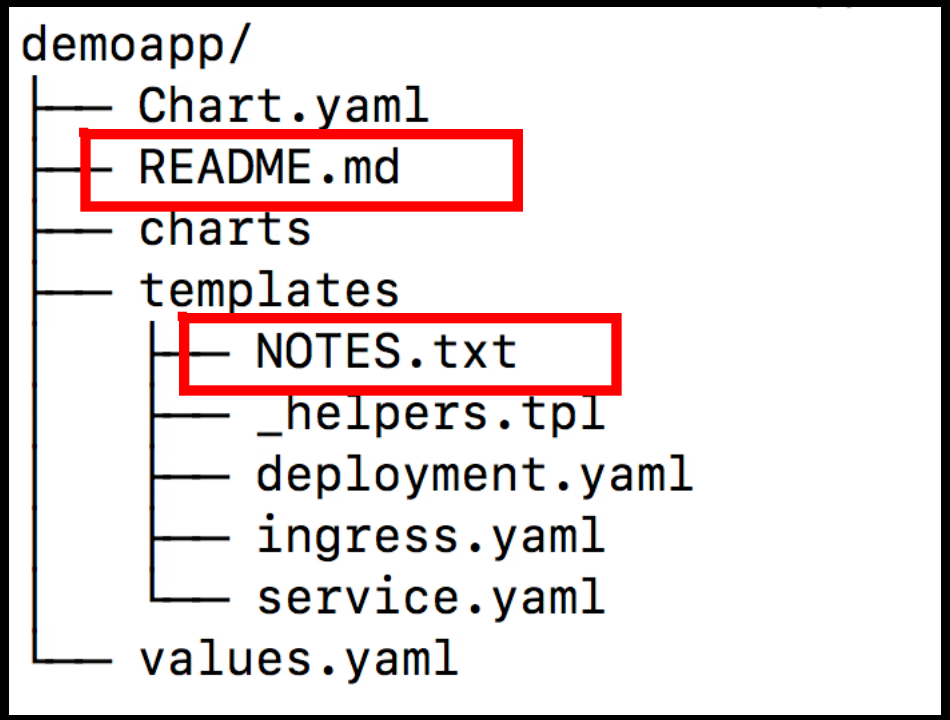
$ helm install -f stagingvalues.yaml ./demoapp

Metadata

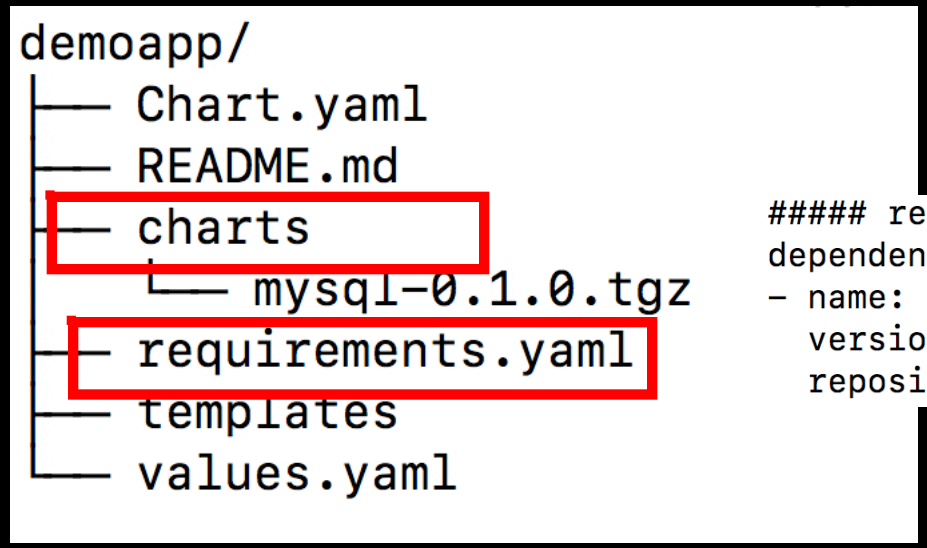
```
demoapp/
├── Chart.yaml
├── charts
├── templates
└── values.yaml
```

```
##### Chart.yaml
apiVersion: v1
description: A Helm chart for Kubernetes
name: demoapp
version: 0.1.0
```

文档说明


demoapp/
Chart.yaml
README.md
charts
templates
NOTES.txt
_helpers.tpl
deployment.yaml
ingress.yaml
service.yaml
values.yaml

应用依赖




```
##### requirements.yaml
dependencies:
- name: mysql
  version: 0.1.0
  repository: https://kubernetes-charts-incubator.storage.googleapis.com/
```

Chart 仓库

- HTTP 服务器
- 提供 index.yaml索引文件和打包的charts

$ helm serve

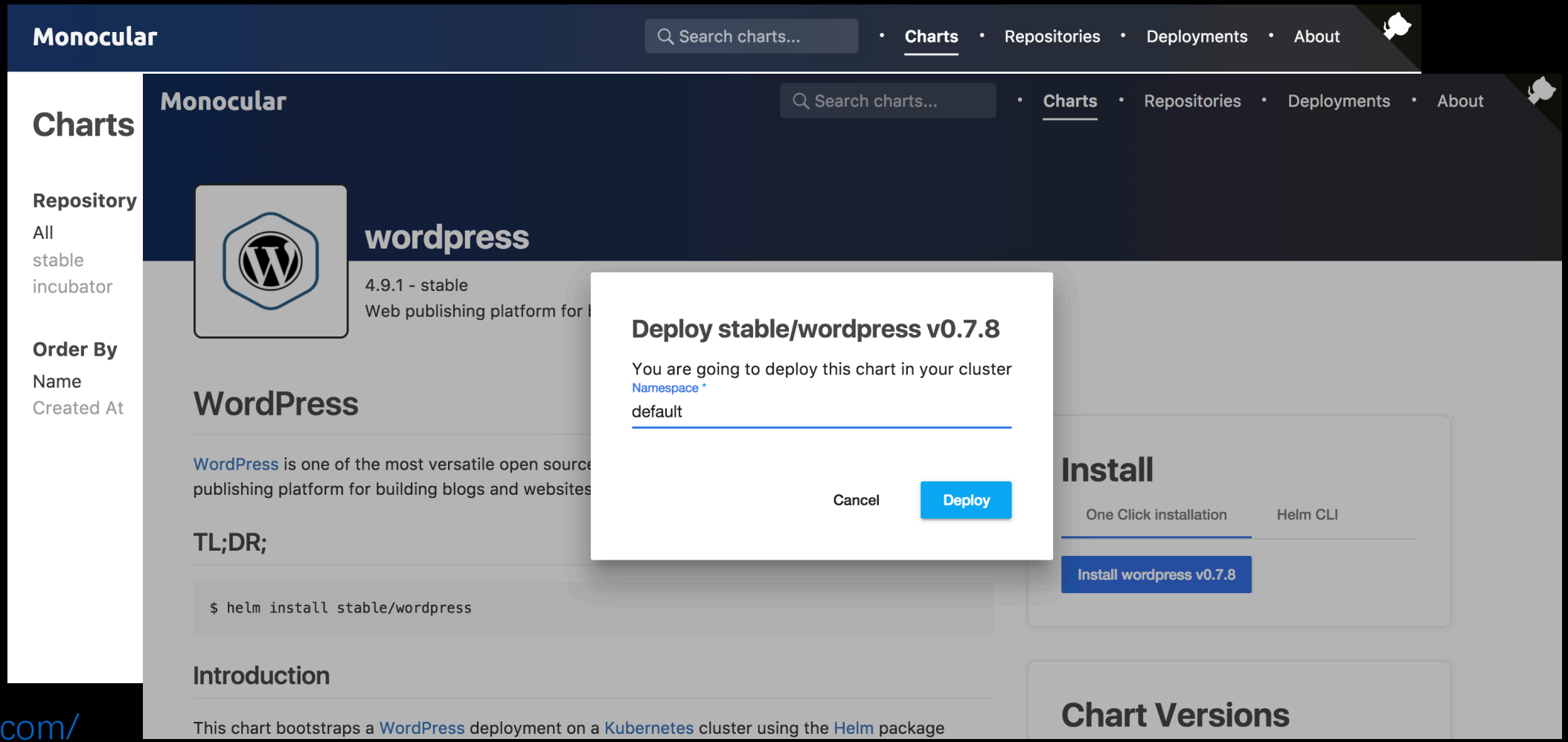
例如 https://example.com/charts 的仓库目录结构

```
charts/
├── index.yaml
├── demoapp-0.1.0.tgz.prov
└── demoapp-0.1.0.tgz
...
```

相关项目

- Stable和incubator chart 仓库:
  - https://github.com/kubernetes/charts
- Monocular: chart的UI管理项目
  - https://github.com/kubernetes-helm/monocular
- Helm Plugins
  - Helm-templates, helm-github, etc.

Monocular



http://demo.com/

Helm的作用

- 利用已有的Chart快速部署进行实验
- 创建自定义Chart，方便地在团队间共享
- 便于管理应用的生命周期
- 便于应用的依赖管理和重用
- 将K8S集群作为应用发布协作中心

Operator

理念

注入领域知识，用软件管理复杂应用

场景一

Scale up一个无状态应用

$ kubectl scale replicas=3

scale up

ReplicaSet

app=web, env=dev

desired=3

Pod

app=web
env=dev

count=1

$ kubectl scale replicas=3

ReplicaSet

app=web, env=dev

desired=3

start

Pod

app=web

env=dev

count=3

场景二
有状态应用的管理

- scale调整数量
- 升级
- 配置更新
- 备份
- 灾难恢复

Scale up etcd

- 在集群中添加新节点的url记录，获取集群信息
- 使用获取的集群信息启动etcd节点

部署etcd

$ kubectl create –f etcd-cluster.yaml

```
apiVersion: "etcd.database.coreos.com/v1beta2"
kind: "EtcdCluster"
metadata:
  name: "example-etcd-cluster"
spec:
  size: 3
  version: "3.2.11"
```

Scale up etcd

$ kubectl apply -f upgrade-example.yaml

```
apiVersion: "etcd.database.coreos.com/v1beta2"
kind: "EtcdCluster"
metadata:
  name: "example-etcd-cluster"
spec:
  size: 5
  version: "3.2.11"
```

原理

- 创建类型为EtcdCluster的自定义资源定义（CRD）
- 通过Kubernetes API管理维护目标应用状态
- Kubernetes Controller 模式：

```
for {
    desired := getDesiredState()
    current := getCurrentState()
    makeChange(desired, current)
}
```

VS

Operator