TRANSWARP
星 环 科 技

应用生命周期管理系统

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www.transwarp.io

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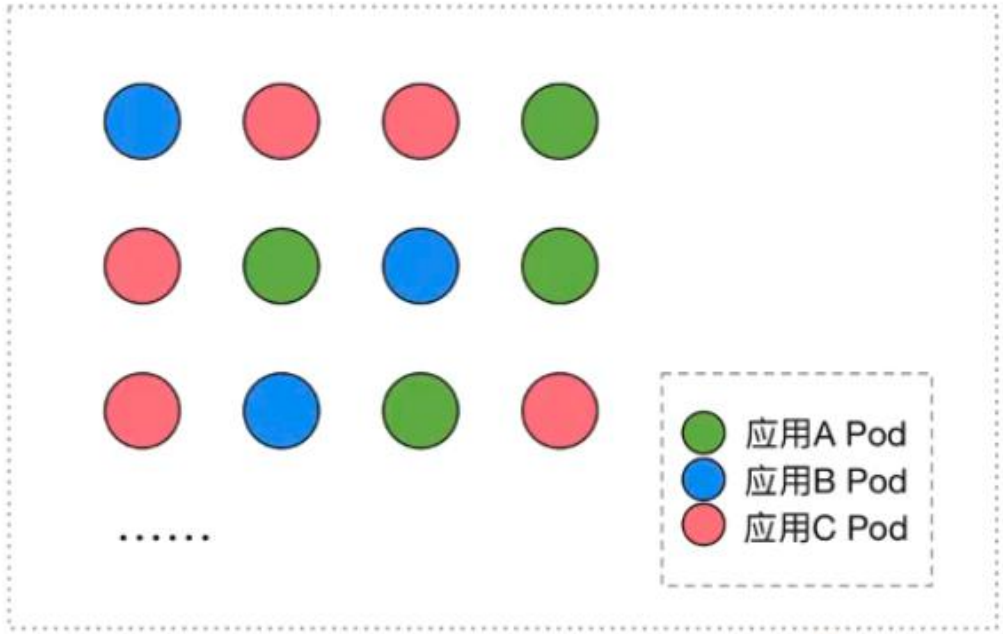
需求来源

背景问题

我们可以直接管理集群中所有的Pod吗?

如果这样做，以下的问题有什么方式来解决?

1. 如何保证集群内可用Pod的数量
2. 如何为所有Pod更新镜像版本
3. 更新的过程中，如何保证服务可用性
4. 更新的过程中，发现问题如何快速回滚



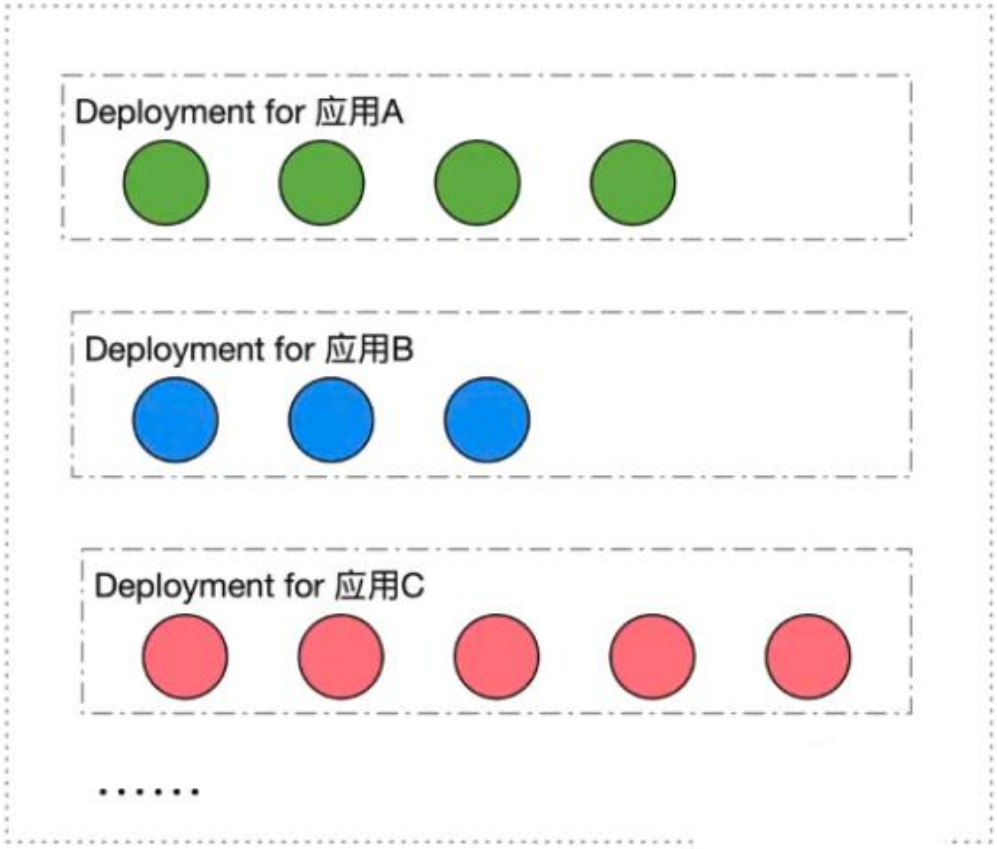
Deployment: 管理部署发布的控制器

Deployment能帮助我们做什么事情?

1. 定义一组Pod的期望数量， controller会维持Pod数量与期望数量一致

2. 配置Pod发布方式，controller会按照给定策略更新Pod，保证更新过程中不可用的pod数量在限定范围内

3. 如果发布有问题，支持“一键”回滚



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Deployment 语法

Deployment语法

新知识点：

replicas：终态数量

template：pod模板

往期回顾：

labels：标签

selector：选择器

pod image：镜像版本

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx:1.7.9
        ports:
        - containerPort: 80
```

Deployment元信息

期望Pod数量

Pod的选择器

Pod模板

查看Deployment状态

```
[root@tdc-tester01 wyc]# kubectl -n cta get deploy
NAME               DESIRED   CURRENT   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment   3         3         3            3           1m
```

DESIRED： 期望的pod数量（replicas）

CURRENT：当前实际的pod数量

UP-TO-DATE： 到达期望版本的pod数量

AVAILABLE： 运行中并可用的pod数量

AGE： deployment 创建的时长

查看pod

pod 名字格式: {deployment-name}-{template-hash}-{random-suffix}

```
[root@tdc-tester01 wyc]# kubectl -n cta get pod
NAME                                READY     STATUS    RESTARTS   AGE
nginx-deployment-67984cd75c-969q2   1/1       Running   0          6m
nginx-deployment-67984cd75c-fd9fk   1/1       Running   0          6m
nginx-deployment-67984cd75c-gs7th   1/1       Running   0          6m
```

kubectl -n cta get pod nginx-deployment-67984cd75c-969q2 -o json | jq .metadata.ownerReferences

```
[
  {
    "apiVersion": "extensions/v1beta1",
    "blockOwnerDeletion": true,
    "controller": true,
    "kind": "ReplicaSet",
    "name": "nginx-deployment-67984cd75c",
    "uid": "fdf60ed5-ce27-11e9-bfee-d61387db2e94"
  }
]
```

pod owner:
ReplicaSet，而非Deployment

更新镜像


```
$ kubectl set image deployment.v1.apps/nginx-deployment nginx=nginx:1.9.1
```

设置镜像	资源类型 固定写法，也可写为 deployment或者 deployment.apps	要更新的 Deployment名字	要更新的 容器名字	新的镜像

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx
spec:
    # . . .
    spec:
      containers:
      - name: nginx
        image: nginx:1.9.1
        ports:
        - containerPort: 80
```

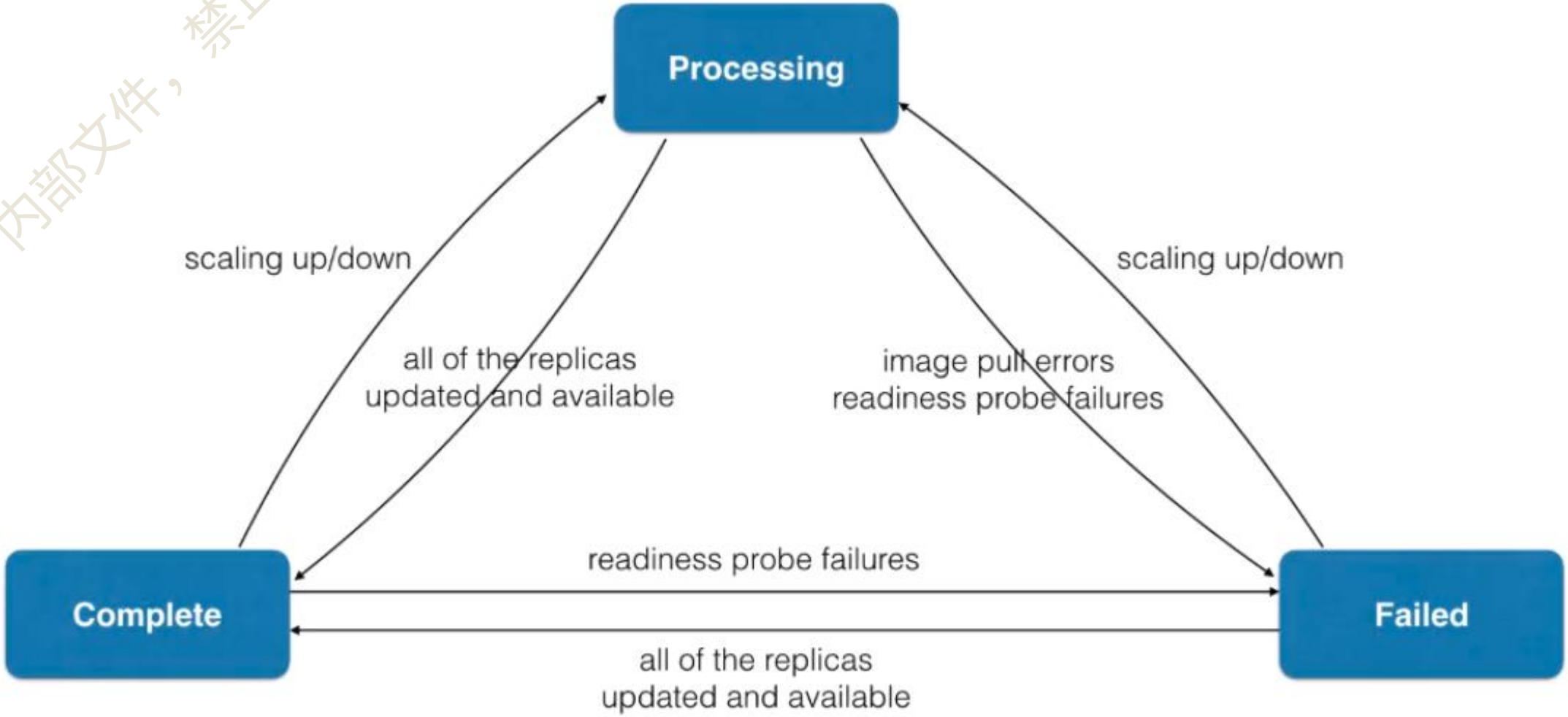
快速回滚

- # 回滚到Deployment上一个版本
- kubectl -n cta rollout undo deployment nginx-deployment

- # 回滚到Deployment某一个版本，需要先查询版本列表
- kubectl -n cta rollout undo deployment nginx-deployment --to-revision=2

- kubectl -n cta rollout history deployment nginx-deployment

Deployment 状态



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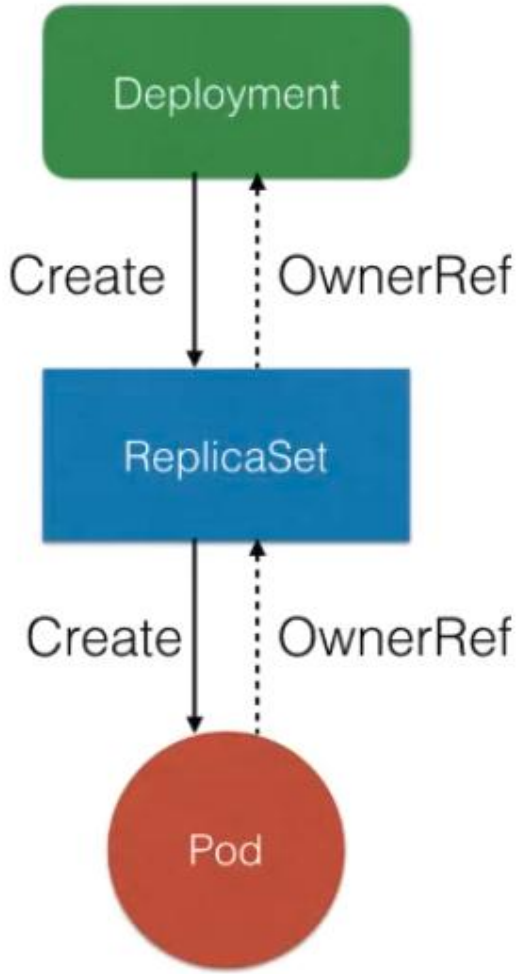
架构设计

管理模式

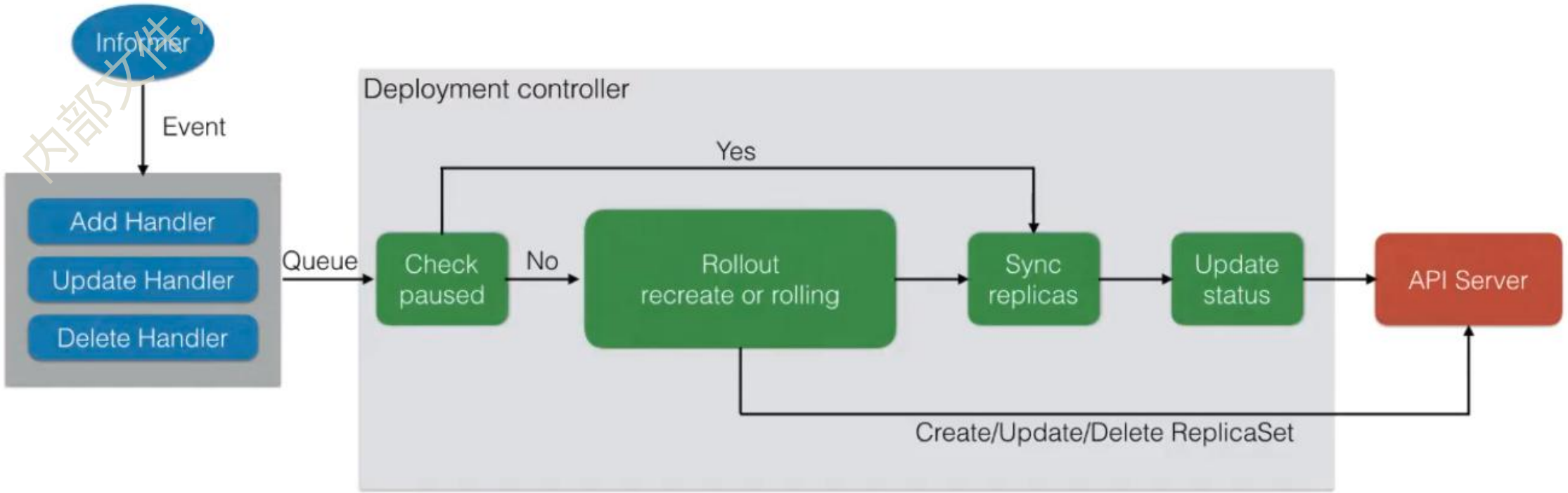
Deployment只负责管理不同版本的ReplicaSet，
由ReplicaSet管理Pod副本数

每个ReplicaSet对应了Deployment template的一个版本

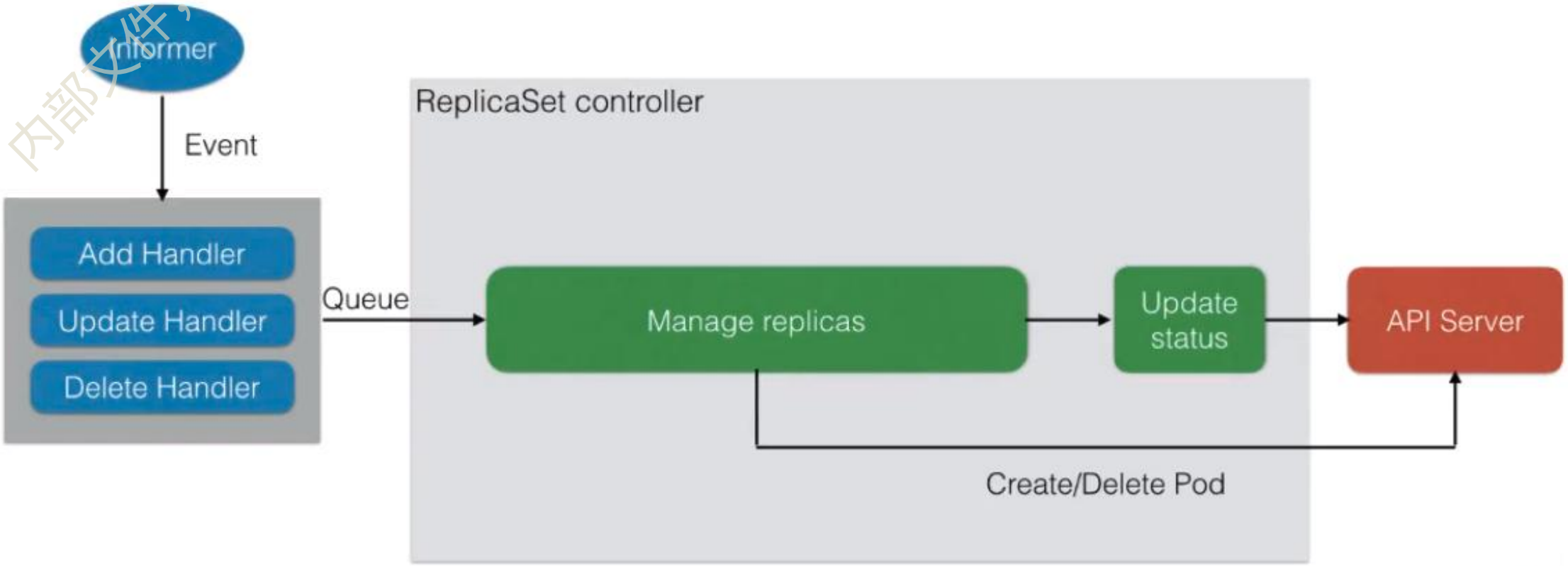
一个ReplicaSet下的Pod都是相同的版本



Deployment 控制器



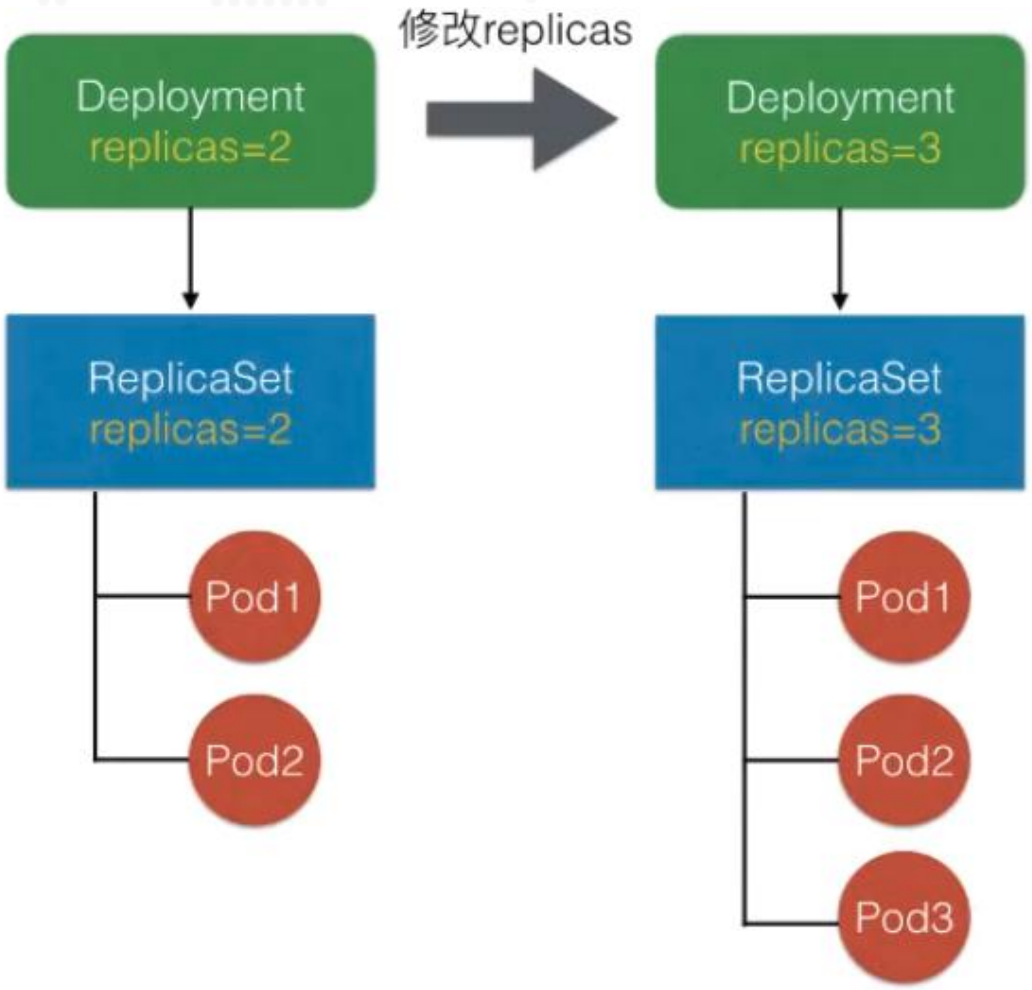
ReplicaSet 控制器



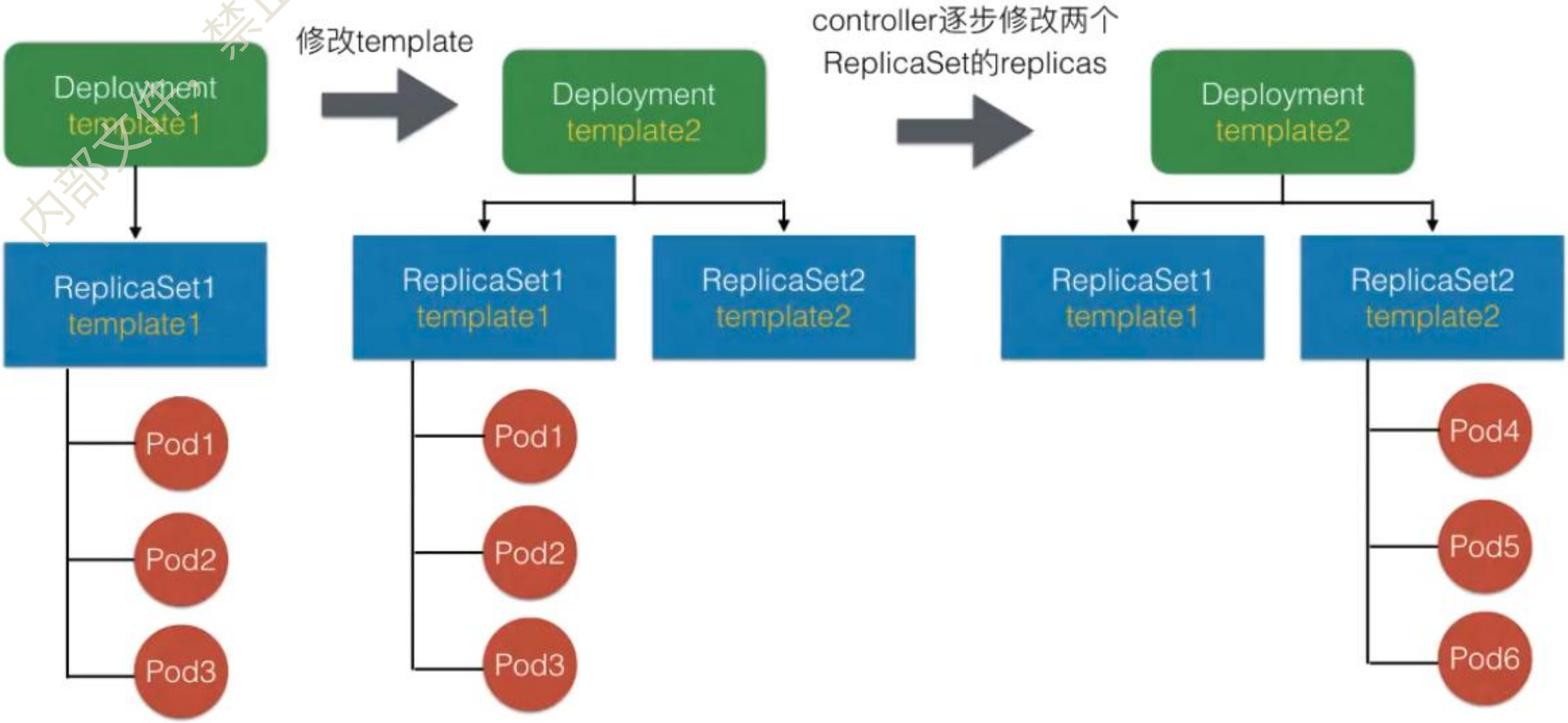
扩容模拟

Deployment的副本数由ReplicaSet管理

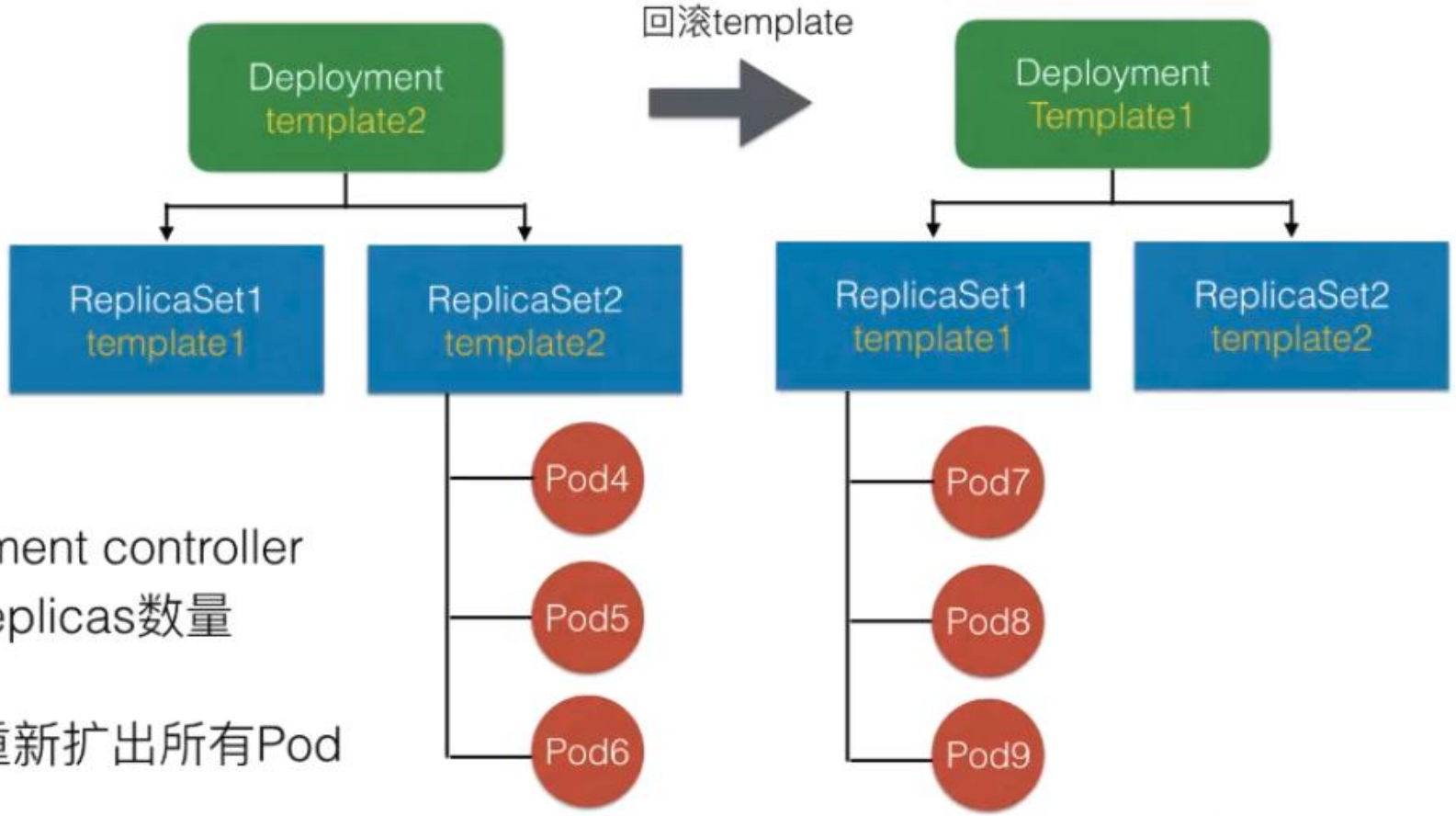
修改Deployment replicas之后，controller会把replicas同步到当前版本的ReplicaSet中，由ReplicaSet执行扩容/缩容



发布模拟



回滚模拟



回滚的过程，其实是Deployment controller
重新调整下属ReplicaSet的replicas数量

最终使旧版本的ReplicaSet重新扩出所有Pod

spec字段解析

MinReadySeconds：
判断Pod available的最小ready时间

revisionHistoryLimit：
保留历史revision(ReplicaSet)的数量，默认值为10

paused：
标识Deployment只做数量维持、不做新的发布

progressDeadlineSeconds：
判断Deployment status condition为failed的最大时间

```
// Minimum number of seconds for which a newly created pod should be ready
// without any of its container crashing, for it to be considered available.
// Defaults to 0 (pod will be considered available as soon as it is ready)
// +optional
MinReadySeconds int32 `json:"minReadySeconds,omitempty" protobuf:"varint,5,opt,name=minReadySecon

// The number of old ReplicaSets to retain to allow rollback.
// This is a pointer to distinguish between explicit zero and not specified.
// Defaults to 10.
// +optional
RevisionHistoryLimit *int32 `json:"revisionHistoryLimit,omitempty" protobuf:"varint,6,opt,name=re

// Indicates that the deployment is paused.
// +optional
Paused bool `json:"paused,omitempty" protobuf:"varint,7,opt,name=paused"`

// The maximum time in seconds for a deployment to make progress before it
// is considered to be failed. The deployment controller will continue to
// process failed deployments and a condition with a ProgressDeadlineExceeded
// reason will be surfaced in the deployment status. Note that progress will
// not be estimated during the time a deployment is paused. Defaults to 600s.
ProgressDeadlineSeconds *int32 `json:"progressDeadlineSeconds,omitempty" protobuf:"varint,9,opt,n
```

升级策略字段解析

MaxUnavailable：
滚动过程中最多有多少个Pod不可用

MaxSurge：
滚动过程中最多存在多少个Pod超过期望replicas数量

```
// Spec to control the desired behavior of rolling update.
type RollingUpdateDeployment struct {
    // The maximum number of pods that can be unavailable during the update.
    // Value can be an absolute number (ex: 5) or a percentage of desired pods (ex: 10%).
    // Absolute number is calculated from percentage by rounding down.
    // This can not be 0 if MaxSurge is 0.
    // Defaults to 25%.
    // Example: when this is set to 30%, the old ReplicaSet can be scaled down to 70% of desired pods
    // immediately when the rolling update starts. Once new pods are ready, old ReplicaSet
    // can be scaled down further, followed by scaling up the new ReplicaSet, ensuring
    // that the total number of pods available at all times during the update is at
    // least 70% of desired pods.
    // +optional
    MaxUnavailable *intstr.IntOrString `json:"maxUnavailable,omitempty" protobuf:"bytes,1,opt,name=maxUnavailable"`

    // The maximum number of pods that can be scheduled above the desired number of
    // pods.
    // Value can be an absolute number (ex: 5) or a percentage of desired pods (ex: 10%).
    // This can not be 0 if MaxUnavailable is 0.
    // Absolute number is calculated from percentage by rounding up.
    // Defaults to 25%.
    // Example: when this is set to 30%, the new ReplicaSet can be scaled up immediately when
    // the rolling update starts, such that the total number of old and new pods do not exceed
    // 130% of desired pods. Once old pods have been killed,
    // new ReplicaSet can be scaled up further, ensuring that total number of pods running
    // at any time during the update is at most 130% of desired pods.
    // +optional
    MaxSurge *intstr.IntOrString `json:"maxSurge,omitempty" protobuf:"bytes,2,opt,name=maxSurge"`
}
```

Thanks

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