Kubernetes from Basic to Advanced

kubernetes

Session #03
Deployments

kubernetes

Session Contents

- Labels & Selectors
- ReplicaSets
- Deployments

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Labels & Selectors

Motivation

- Number of pods start to grow inside clusters
- Need to make some grouping to better handle similar pods
- At same time, this grouping need to agility and openness
- The answer is using labels like in many other systems and solutions

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Labels

- Declarative way to identify (categorize, group) Kubernetes objects
- Enable mapping organizational structures onto system objects in a loosely coupled fashion, without requiring clients to store these mappings
- Can be set on any Kubernetes object (Nodes, pods, …)
- A Kubernetes object can have zero to many labels

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Labels: Properties

- Simple key-value pair
- Cannot be a list
- Needs to be unique per object
- Labels are case sensitive

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Labels: Name format

`prefix/name`

- `prefix`
  - Is optional
  - Must follow a DNS subdomain format
  - No longer than 63 chars
  - Example: k8s.io, contoso.com, acme.net
- `name`
  - Is mandatory
  - Must start alphanumeric character
  - Can include dash (-), underscore (_) or dot (.)
  - No longer than 253 characters

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Labels: Selectors

- Label selectors allow to identify a group of objects
- A selector uses labels to make a match and create the group
- This matching is dynamic meaning if new objects are created, they are included on the group
- Two options: equality-based and set-based
- Equality: =, ==, !=
- Set: in, notin

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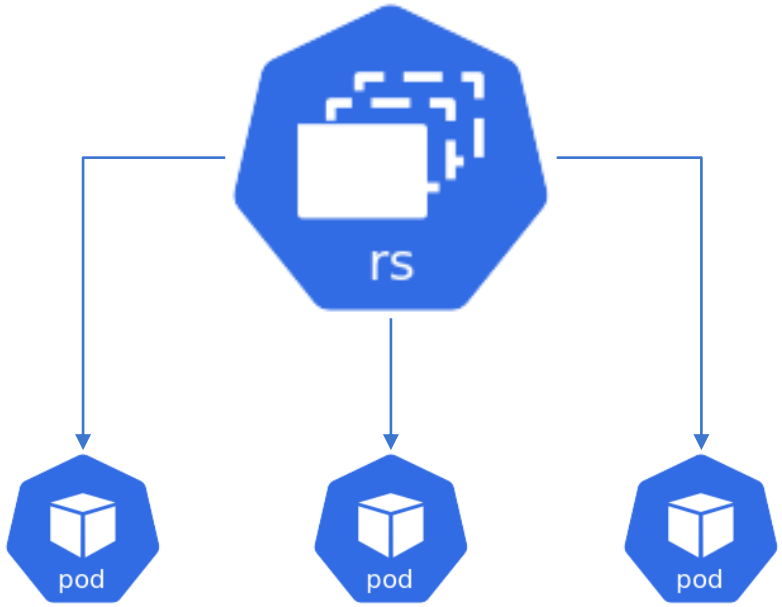
Demo | Labels & Selectors

ReplicaSet

ReplicaSets

- ReplicaSet purpose is to maintain a stable set of replica Pods running at any given time
- Used to guarantee the availability of a specified number of identical Pods



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How it works?

- A ReplicaSet includes a selector to identify Pods to be managed by
- Defines a number of replicas indicating how many Pods it should be maintaining
- A pod template specifying the data of new Pods it should create to meet the number of replicas criteria
- A ReplicaSet then fulfills its purpose by creating and deleting Pods as needed to reach the desired number
- When a ReplicaSet needs to create new Pods, it uses its Pod template

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ReplicaSet Manifest

ReplicaSet properties

replica set the number of pods

selector finds the template

template defines PodSpec

```yaml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: myapp-rs
  labels:
    app: myapp
    tier: front
spec:
  replicas: 3
  selector:
    matchLabels:
      tier: front
  template:
    metadata:
      labels:
        tier: front
    spec:
      containers:
      - name: nginx
        image: nginx
```

Demo | ReplicaSets

Some issues

- ReplicaSet identifies new Pods to acquire by using its selector
- If there is a Pod that matches a ReplicaSet's selector, it will be immediately acquired
- This means that you may never need to manipulate ReplicaSet objects directly

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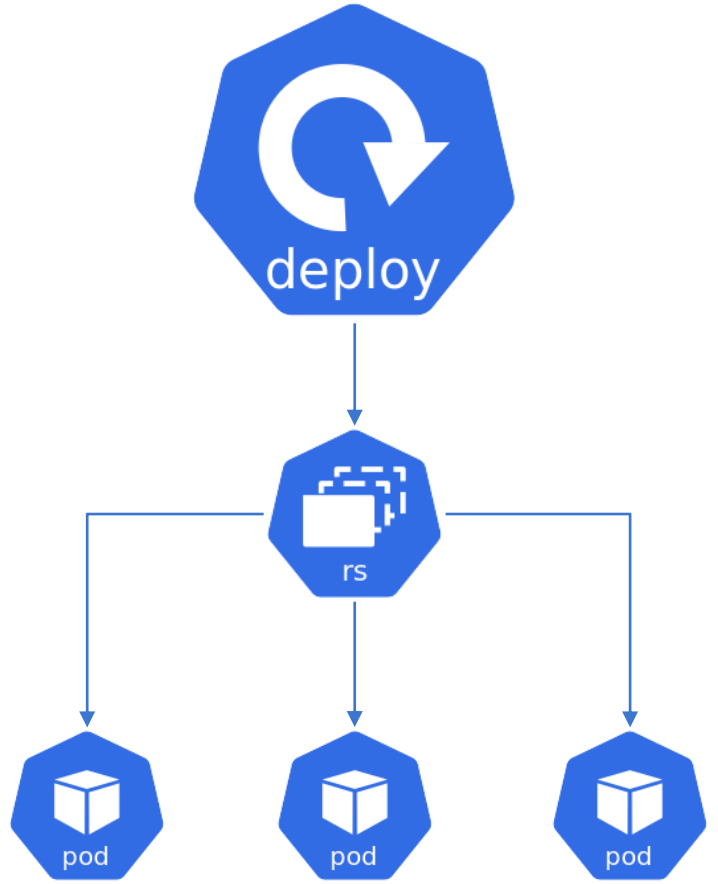
Deployments

Deployments

- A Deployment is a higher-level controller that manages ReplicaSets
- Provides declarative updates to Pods along with a lot of other useful features.



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Deploymeny Manifest

Deployment properties

replica set the number of pods

selector finds the template

template defines PodSpec

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: workload-1-dep
spec:
  replicas: 6
  selector:
    matchLabels:
      app: workload-1
  template:
    metadata:
      labels:
        app: workload-1
        color: lime
    spec:
      containers:
        - name: workload
          image: nginx:1.18
          ports:
            - containerPort: 80
```

Deployment

- Describe a desired state in a Deployment
- Deployment Controller changes the actual state to the desired state at a controlled rate
- Deployments provide fine-grained control over how and when a new pod version is rolled out as well as rolled back to a previous state

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How it works?

1. We are running a deployment with 2 replicas of a pod with an application with yellow background
2. Developer makes the change to the deployment image tag and to sets the background to green
3. The Deployment creates a ReplicaSet v2, which will create 2 new Pods with the updated image.
4. Once the new Pods are up and running, the Pods attached to ReplicaSet v1 are deleted.
5. ReplicaSet v1 is not deleted

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Deployment Strategy

- A deployment strategy is a way to change or upgrade an application
- Rolling Update - Consists of slowly rolling out a new version of an application by replacing instances one after the old version until all the instances are rolled out. This is the default strategy for Kubernetes Deployments when none is specified.
- Recreate - Consists of shutting down all instances of the current version, then deploying the new version. This technique implies downtime of the service that depends on both shutdown and boot duration of the application.

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Demo | Deployments

Questions?

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Lab #02: Deployment lifecycle

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