# Managing Objects with Labels, Annotations, and Namespaces

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# Course Overview

Using the Kubernetes API

Managing Objects with Labels, Annotations, and Namespaces

Running and Managing Pods

# Overview

Organizing Objects in Kubernetes

- Namespaces
- Labels
- Annotations

How Kubernetes uses Labels

- Services
- Deployments
- Scheduling

# Organizing Objects in Kubernetes

**Namespaces**

**Labels**

**Annotations**

# Namespaces

**Ability to subdivide a cluster and its resources**

**Conceptually a “virtual cluster”**

**Deploy objects into a Namespace**

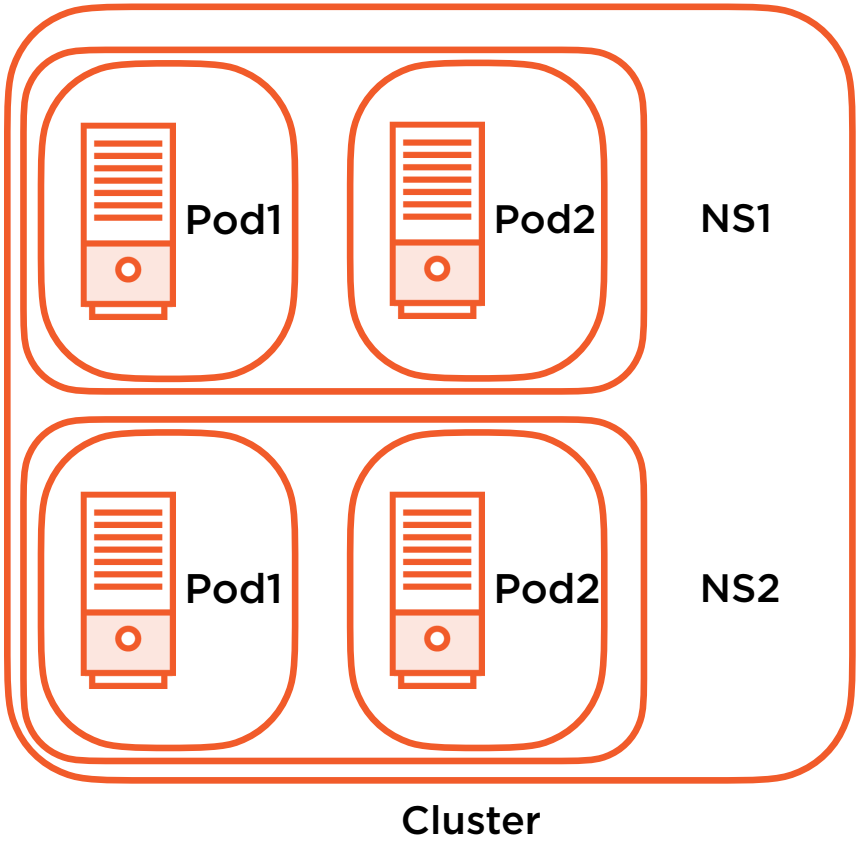
**Resource isolation/organization**

# Namespaces (con't)

- **Security boundary for Role-based Access Controls**
- **Naming boundary**
- **A resource can be in only one namespace**
- **Has nothing to do with the concept of a Linux namespace**

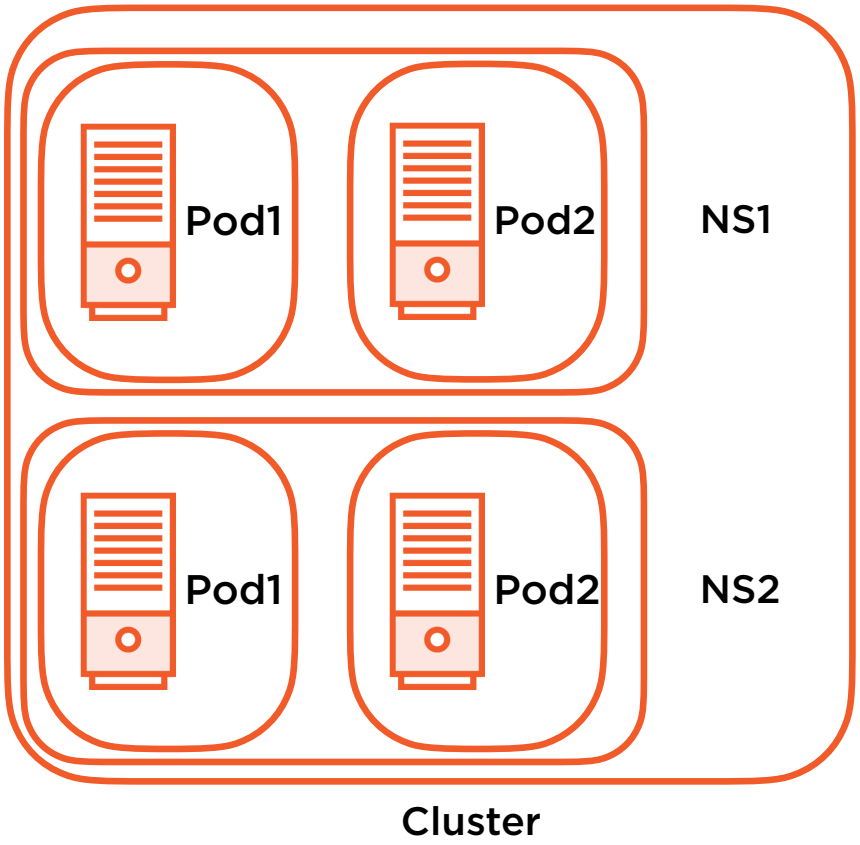
# Working with Namespaces

- **Create/Query/Delete**
- **Operate on objects in a Namespace**
- **Some objects are Namespaced… some aren't**
  - **Resources are Namespaced…**`Pods`, `Controllers`, `Services`
  - **Physical things are not…** `PersistentVolumes`, `Nodes`



# Working with Namespaces (con't)

- `default`
- `kube-public`
- `kube-system`
- **User Defined**
  - **Imperatively with** `kubectl`
  - **Declaratively in a Manifest in YAML**



```
apiVersion: v1
kind: Namespace
metadata:
  name: playgroundinyaml
---
apiVersion: apps/v1
kind: Deployment
metadata:
  namespace: playgroundinyaml
```

# Creating Namespaces and Creating Objects in Namespaces

```
kubectl create namespace playground1

kubectl run nginx --image=nginx --namespace playground1
```

# Demo

Creating a Namespace

Adding resources to a Namespace

Querying a Namespace

Interacting with resources in a Namespace

Deleting all resources in a Namespace

# Labels

**Used to organize resources -** Pods, Nodes **and more**

**Label Selectors are used to select/query Objects**

**Return collections of Objects that satisfy search conditions**

**Enables you to perform operations on a collection of resources...like** Pods

**Influence internal operations of Kubernetes**

# Labels (con't)

- Non-hierarchical, key/value pair
- Have more than one label per resource
- Enables more complex representations of state and ability to query
- Keys can be 63 characters or less
- Values can be 253 characters or less

# Using Labels

- **Creating resources with Labels**
  - **Imperatively with `kubectl`**
  - **Declaratively in a Manifest in YAML**
- **Editing existing resources' Labels**
  - **Assign (add) a new Label**
  - **Overwriting an existing Label**

```
apiVersion: v1
kind: Pod
metadata:
  name: nginx
  labels
    app: v1
    tier: PROD
spec:
   ...
```

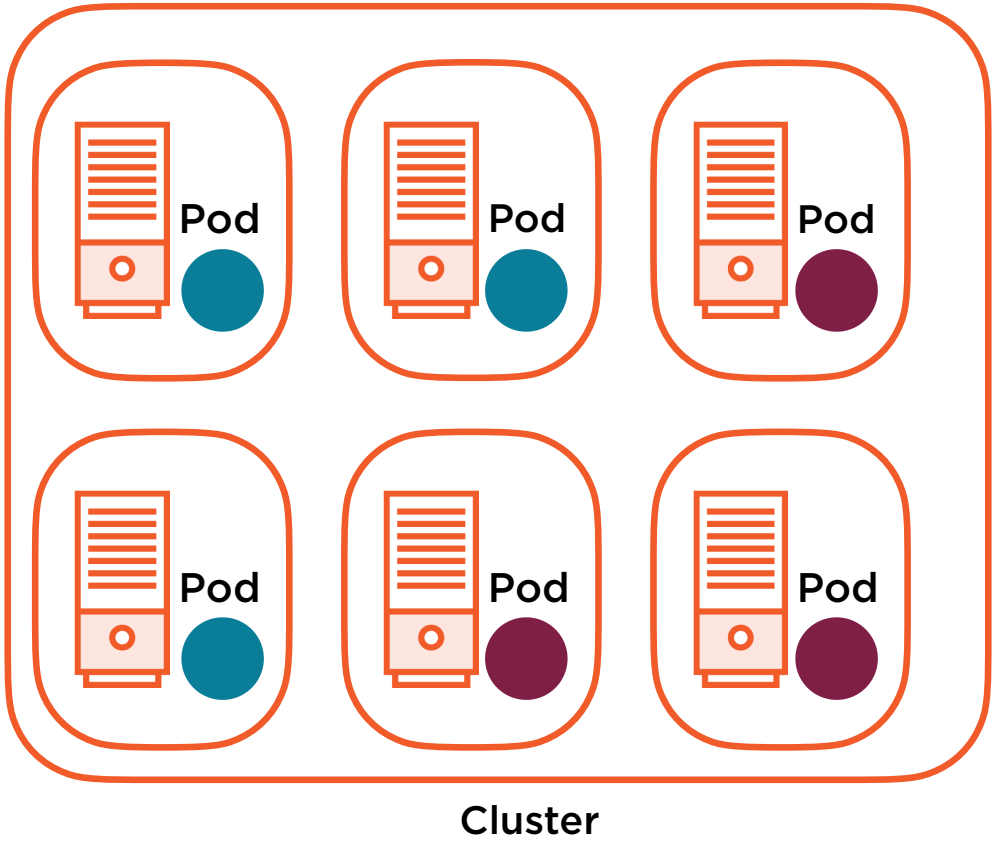
## Adding and Editing Labels

```
kubectl label pod nginx tier=PROD app=v1

kubectl label pod nginx tier=DEBUG app=v1 --overwrite

kubectl label pod nginx app-
```

# Using Labels in Kubernetes



# Querying Using Labels and Selectors

| | | | | |
|---|---|---|---|---|
| `kubectl` | `get` | `pods` | `--show-labels` | |
| `kubectl` | `get` | `pods` | `--selector` | `tier=prod` |
| `kubectl` | `get` | `pods` | `-l` | `'tier in (prod,qa)'` |
| `kubectl` | `get` | `pods` | `-l` | `'tier notin (prod,qa)'` |
| `kubectl` | `get` | `nodes` | `--show-labels` | |

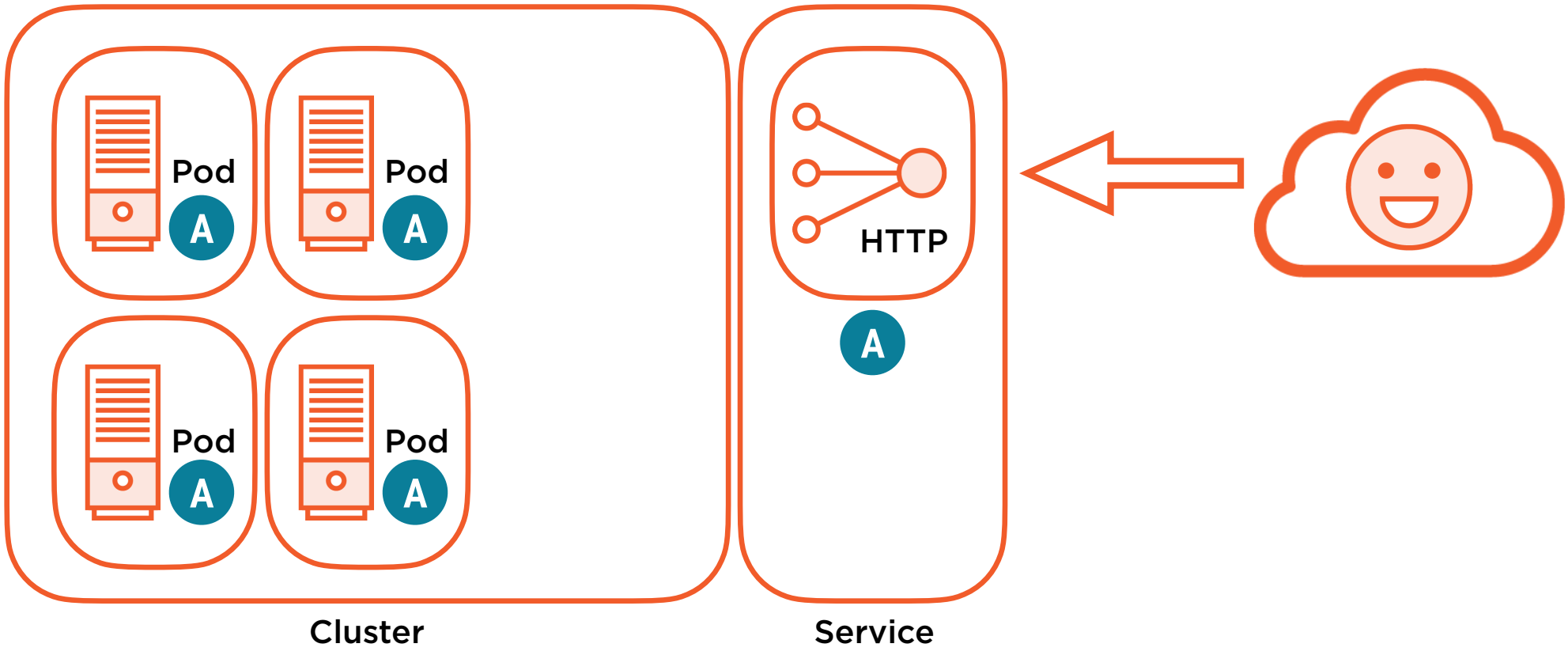
# How Kubernetes Uses Labels

**Controllers and Services match** Pods **using Selectors**

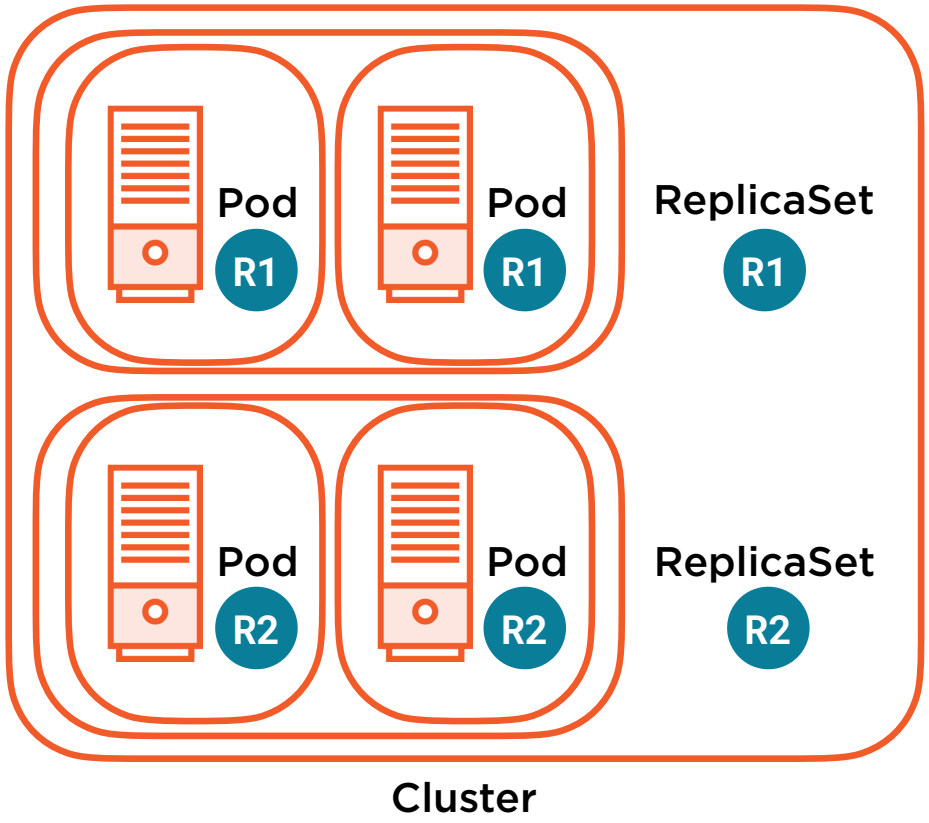
**Influencing Pod Scheduling**

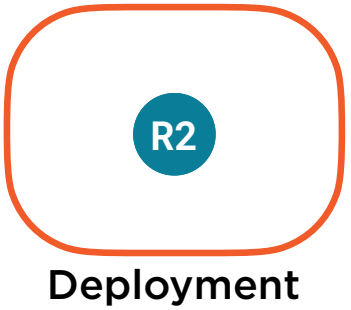
- **Scheduling to specific Nodes**
- **Special hardware (SSD or GPU)**
- **Using a label selector**

# Services

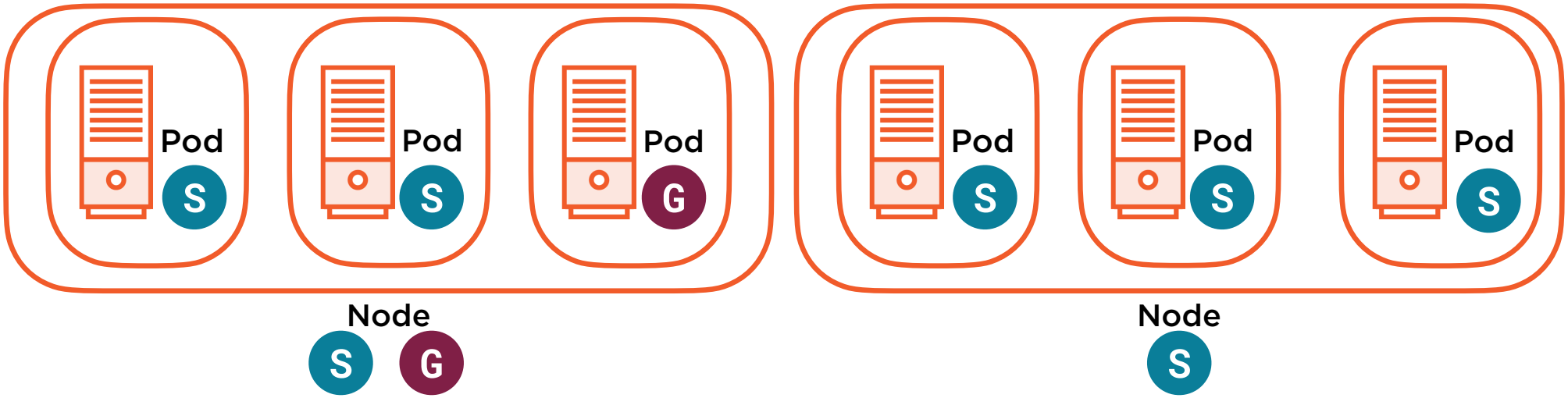


# Controller Operations - Deployment



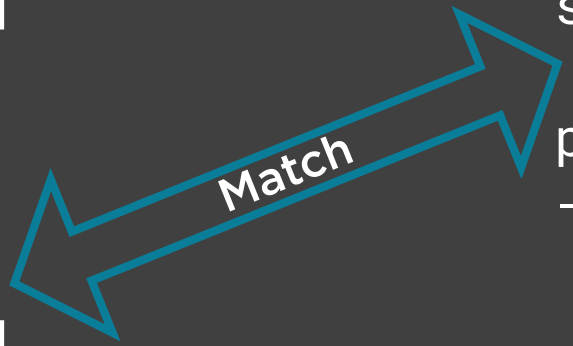



# Scheduling Pods to Nodes



# Defining Deployments and Services

```
kind: Deployment
...
spec:
 selector:
      matchLabels:
        run: hello-world
...
  template:
    metadata:
      labels:
        run: hello-world
    spec:
        containers:
...
```


```
kind: Service
...
spec:
  selector:
    run: hello-world
  ports:
  - port: 80
    protocol: TCP
    targetPort: 8080
```

# Demo

Working with Labels

Interacting with Pods by Name and Label

Kubernetes resource management

- Services
- Deployments
- Pod Scheduling

# Annotations

Used to add additional information about your cluster resources

Mostly used by people or tooling to make decisions

Build, release, and image information exposed in easily accessible areas

Saves you from having to write integrations to retrieve data from external data sources

# Annotations (con't)

**Non-hierarchical, key/value pair**

**Can't be used to query/select Pods or other resources**

**Data is used for "other" purposes**

**Keys can be up to 63 characters**

**Values can be up to 256KB**

```
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
  annotation: owner: Anthony
spec:
  containers:
  - name: nginx
    image: nginx
...
```

# Adding and Editing Annotations

```
kubectl annotate pod nginx-pod owner=Anthony
```

```
kubectl annotate pod nginx-pod owner=NotAnthony --overwrite
```

# Organizing Objects in Kubernetes

**Namespaces - When you want to put a boundary around resources, security, or naming**

**Labels - When you want to act on objects in groups or influence k8s operations**

**Annotations - When you want to add additional information about a resource**

# Summary

Organizing Objects in Kubernetes

- Namespaces
- Labels
- Annotations

How Kubernetes uses Labels

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- Deployments
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# What's Next!

## Running and Managing Pods