A Service provides a single point of entry for accessing one or more Pods

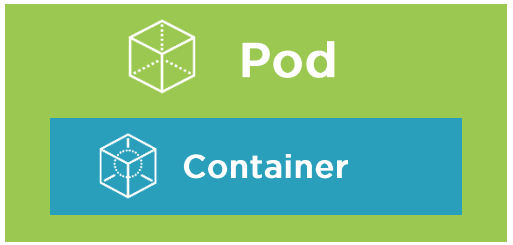
Pods are "mortal" and may only live a short time (ephemeral)

You can't rely on a Pod IP address staying the same

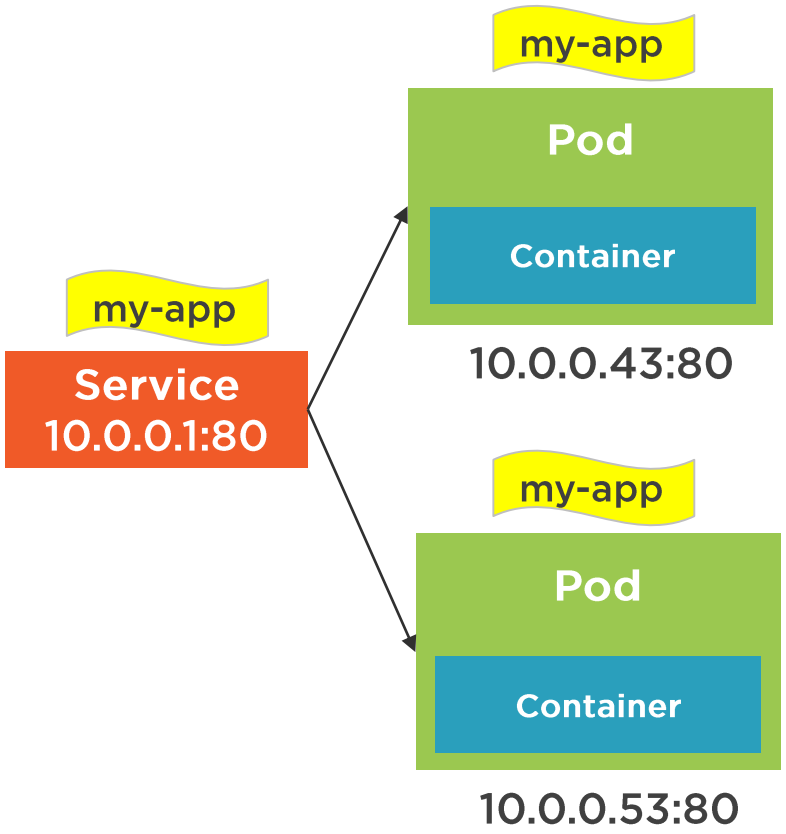
Pods can be horizontally scaled so each Pod gets its own IP address

A Pod gets an IP address after it has been scheduled (no way for clients to know IP ahead of time)

The Life of a Pod

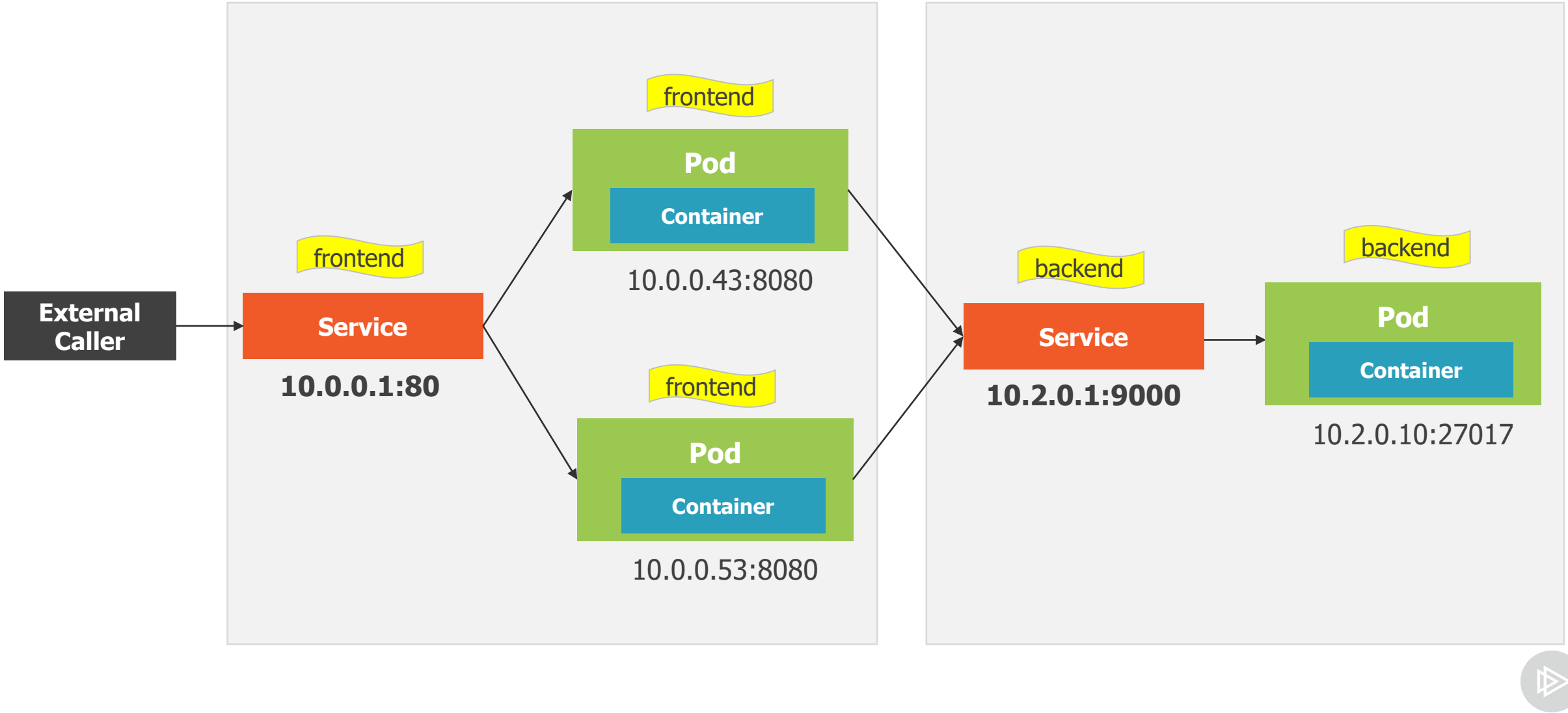


The Role of Services

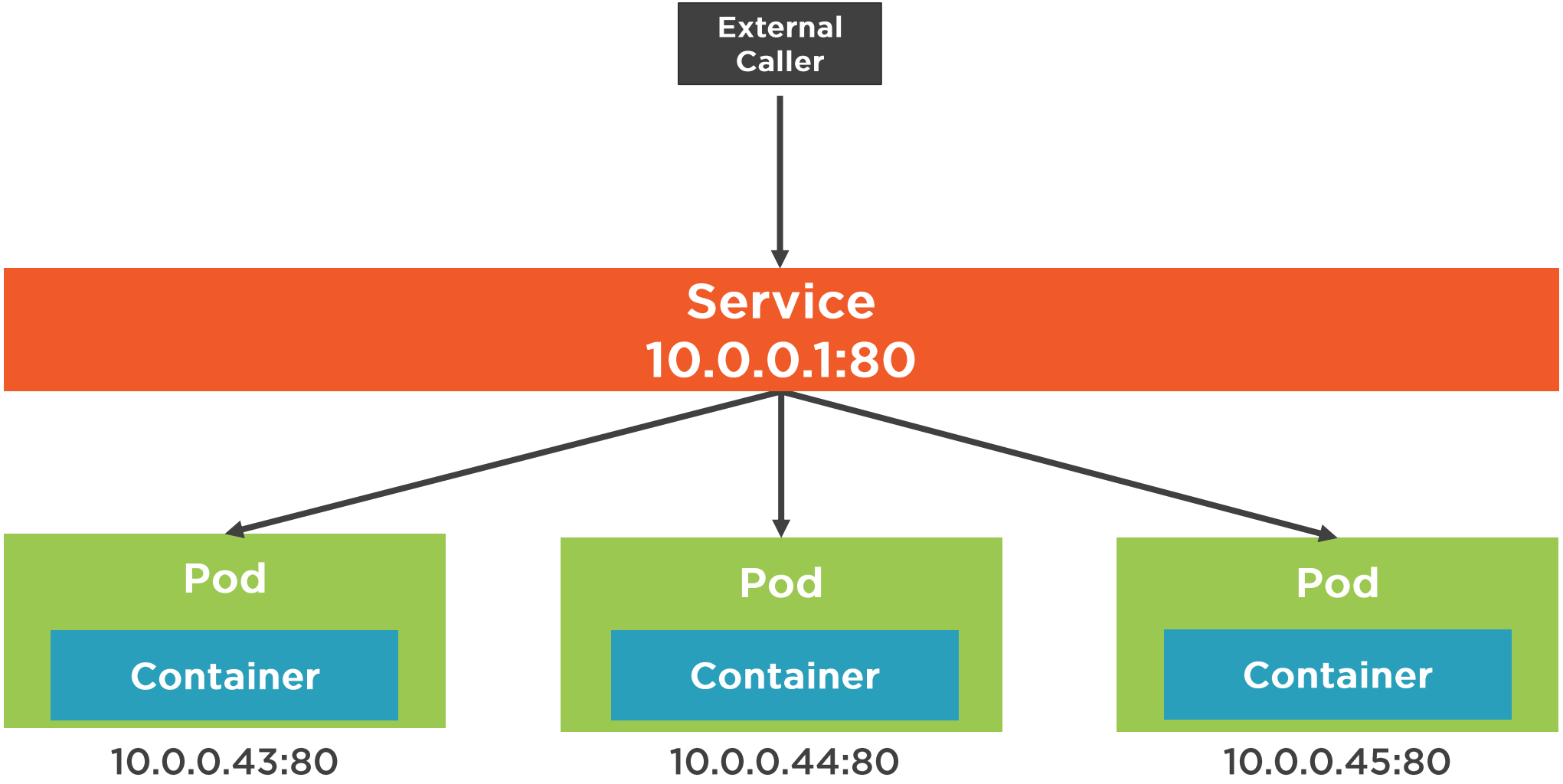


- Services abstract Pod IP addresses from consumers
- Load balances between Pods
- Relies on labels to associate a Service with a Pod
- Node's kube-proxy creates a virtual IP for Services
- Layer 4 (TCP/UDP over IP)
- Services are not ephemeral
- Creates endpoints which sit between a Service and Pod

Calling Services



Services and Pod Load Balancing



Service Types

Services can be defined in different ways:

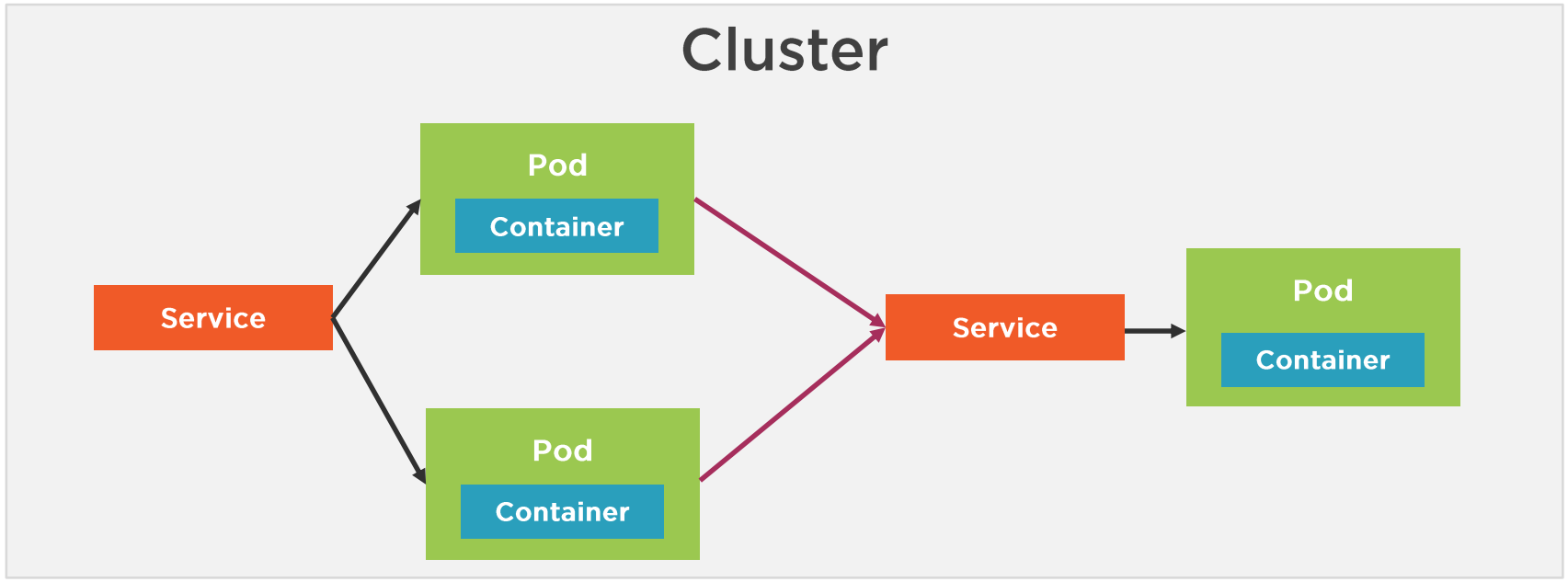
- ClusterIP – Expose the service on a cluster-internal IP (default)
- NodePort – Expose the service on each Node's IP at a static port.
- LoadBalancer – Provision an external IP to act as a load balancer for the service
- ExternalName – Maps a service to a DNS name

ClusterIP Service

Service IP is exposed internally within the cluster

Only Pods within the cluster can talk to the Service

Allows Pods to talk to other Pods

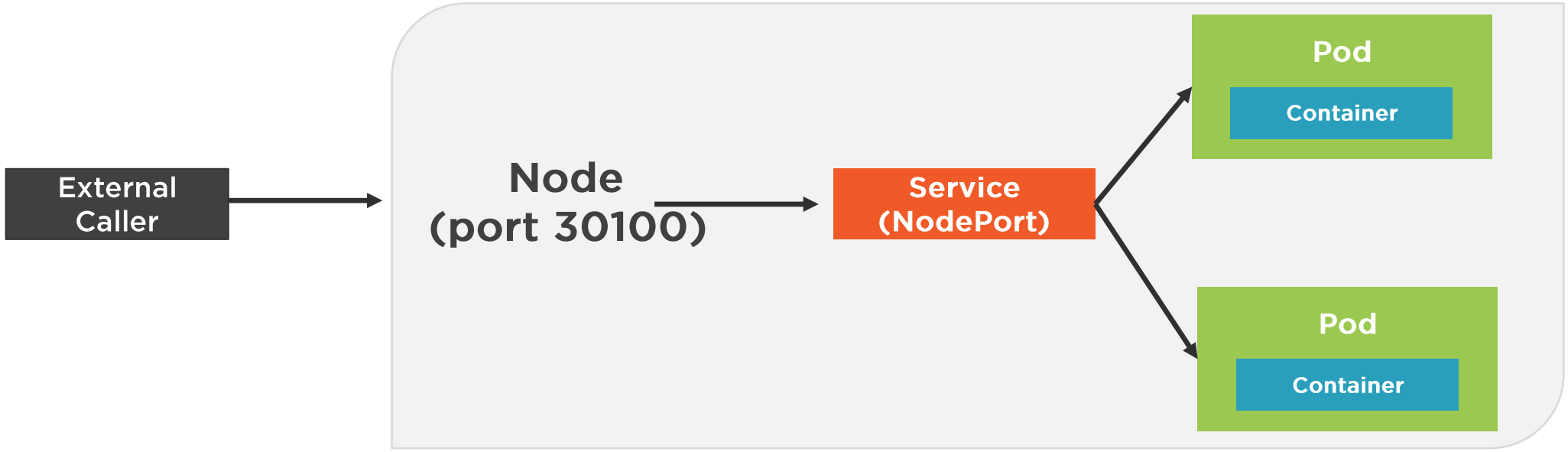


NodePort Service

Exposes the Service on each Node's IP at a static port

Allocates a port from a range (default is 30000-32767)

Each Node proxies the allocated port



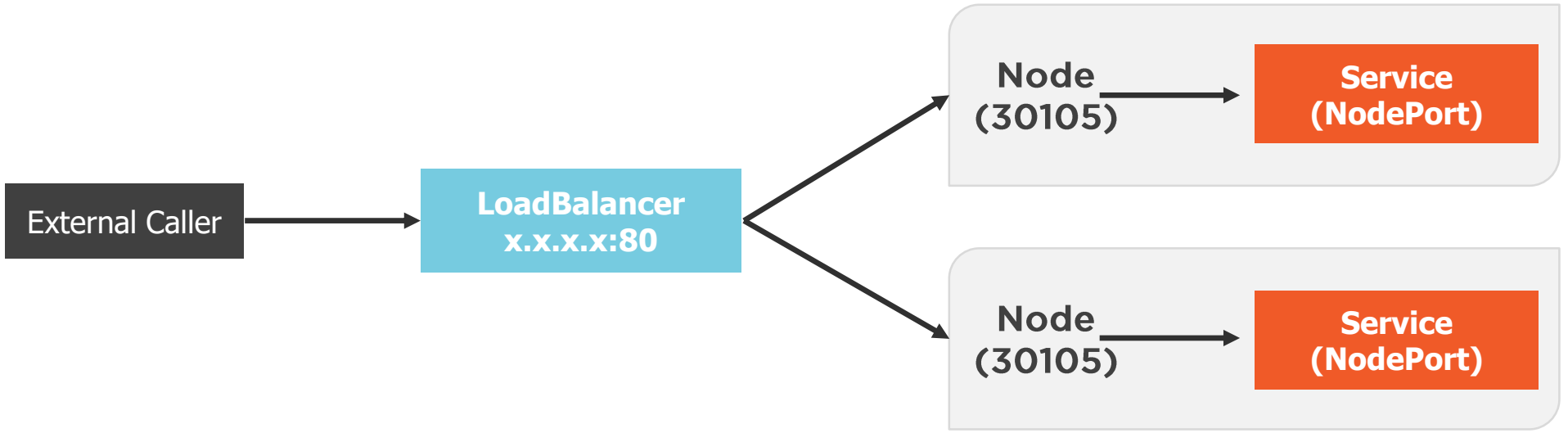
LoadBalancer Service

Exposes a Service externally

Useful when combined with a cloud provider's load balancer

NodePort and ClusterIP Services are created

Each Node proxies the allocated port

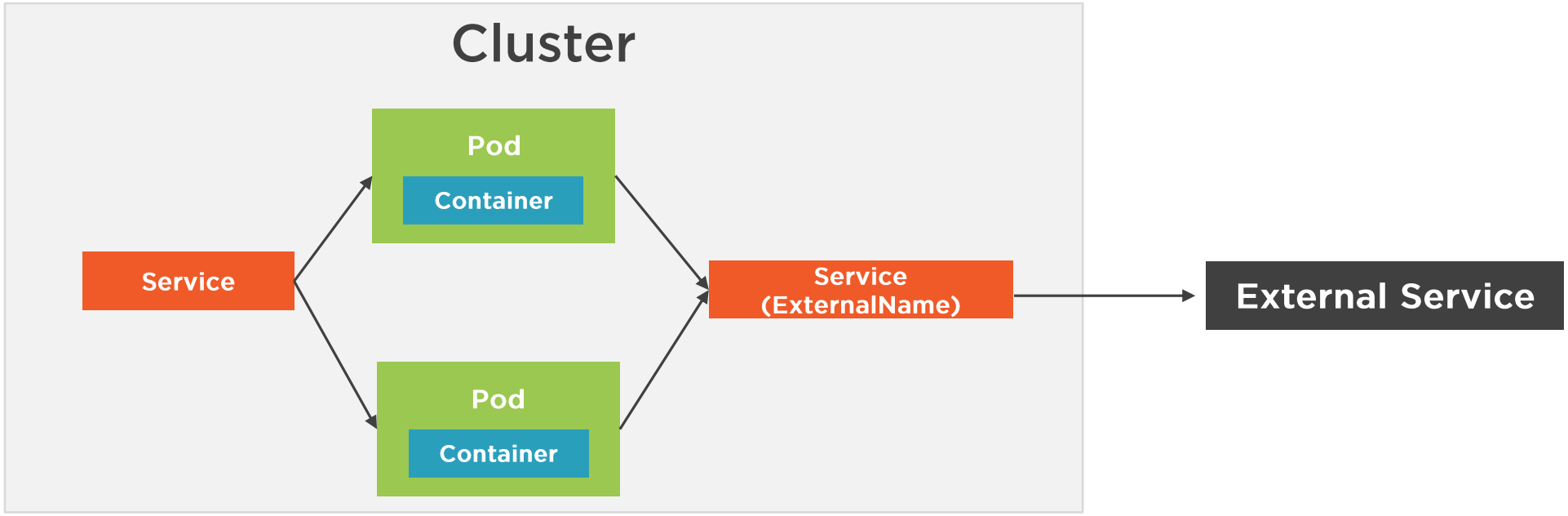


ExternalName Service

Service that acts as an alias for an external service

Allows a Service to act as the proxy for an external service

External service details are hidden from cluster (easier to change)



Port Forwarding

Q. How can you access a Pod from outside of Kubernetes?

A. Port forwarding

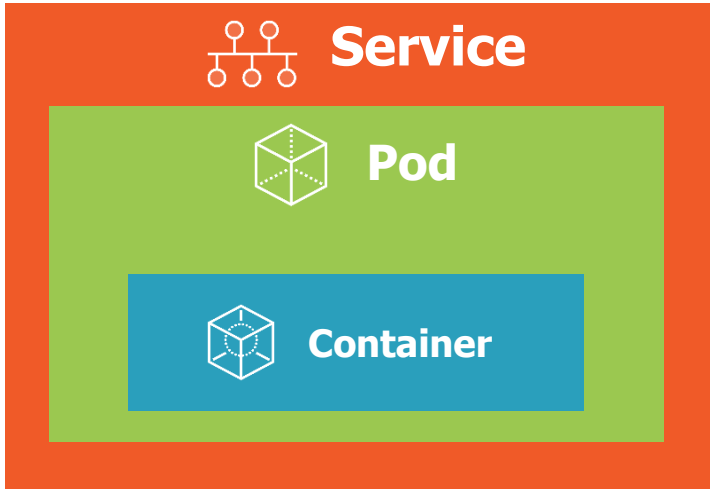
Use the kubectl port-forward to forward a local port to a Pod port

```
# Listen on port 8080 locally and forward to port 80 in Pod
kubectl port-forward pod/[pod-name] 8080:80

# Listen on port 8080 locally and forward to Deployment's Pod
kubectl port-forward deployment/[deployment-name] 8080

# Listen on port 8080 locally and forward to Service's Pod
kubectl port-forward service/[service-name] 8080
```

Defining a Service with YAML

Service

+ kubectl =



Service Overview

```
apiVersion: v1
kind: Service
metadata:
spec:
  type:

  selector:

  ports:
```

- Kubernetes API version and resource type (Service)
- Metadata about the Service
- Type of service (ClusterIP, NodePort, LoadBalancer) – defaults to ClusterIP
- Select Pod template label(s) that service will apply to
- Define container target port and the port for the service

Defining a Service

```
apiVersion: v1
kind: Service
metadata:
  name: nginx
  labels:
    app: nginx
spec:
  selector:
    app: nginx
  ports:
  - name: http
    port: 80
    targetPort: 80
```

- Kubernetes API version and resource type (Service)
- Metadata about the Service
- Service will apply to resources with a label of app: nginx
- Define container target port(s) and the port(s) for the Service

Connecting to a Service by It's DNS Name

```
apiVersion: v1
kind: Service
metadata:
  name: frontend
  ...

apiVersion: v1
kind: Service
metadata:
  name: backend
  ...
```

- Name of Service (each Service gets a DNS entry)

- A frontend Pod can access a backend Pod using **backend:port**

Creating a NodePort Service

```
apiVersion: v1
kind: Service
metadata:
  ...
spec:
  type: NodePort
  selector:
    app: nginx
  ports:
  - port: 80
    targetPort: 80
    nodePort: 31000
```

- Set Service *type* to NodePort
- Optionally set NodePort value (defaults between 30000-32767)

Creating a LoadBalancer Service

```
apiVersion: v1
kind: Service
metadata:
  ...
spec:
  type: LoadBalancer
  selector:
    app: nginx
  ports:
  - port: 80
    targetPort: 80
```

- Set Service *type* to LoadBalancer (normally used with cloud providers)

Creating an ExternalName Service

```
apiVersion: v1
kind: Service
metadata:
  name: external-service
spec:
  type: ExternalName
  externalName: api.acmecorp.com
  ports:
  - port: 9000
```

- Other Pods can use this FQDN to access the external service
- Set type to ExternalName
- Service will proxy to FQDN

Creating a Service

Use the kubectl create command along with the --filename or -f switch

```
# Create a Service
kubectl create -f file.service.yml
```

```
NAME              TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)    AGE
kubernetes        ClusterIP   10.96.0.1      <none>        443/TCP    55d
nginx-clusterip   ClusterIP   10.102.26.70   <none>        8080/TCP   6s
```

```
# Update a Service
# Assumes --save-config was used with create
kubectl apply -f file.service.yml
```

Updating or Creating a Service

Use the kubectl apply command along with the --filename or -f switch

Deleting a Service

Use the kubectl delete command along with the --filename or -f switch

```
# Delete a Service
kubectl delete -f file.service.yml
```

```
# Shell into a Pod and test a URL. Add -c [containerID]
# in cases where multiple containers are running in the Pod
kubectl exec [pod-name] -- curl -s http://podIP

# Install and use curl (example shown is for Alpine Linux)
kubectl exec [pod-name] -it sh
> apk add curl
> curl -s http://podIP
```

Testing a Service and Pod with curl

How can you quickly test if a Service and Pod is working?

Use **kubectl exec** to shell into a Pod/Container