



# **KUBERNETES**

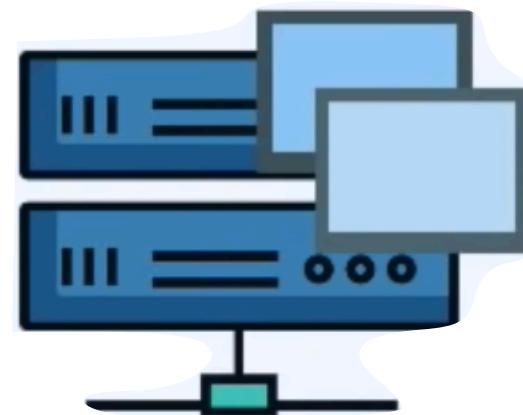
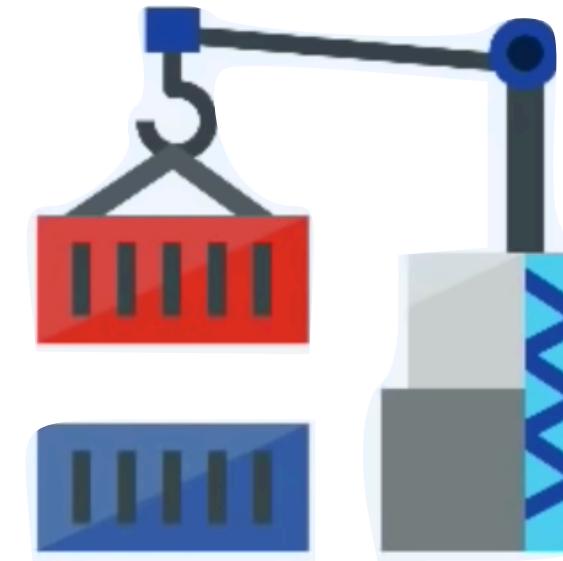
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**NEHAL JHAJHARIA**  
**U20CS093**

# Official definition of Kubernetes



- ▶ Open source container **orchestration tool**
- ▶ Developed by **Google**
- ▶ Helps manage containerized applications  
in **different deployment environments**



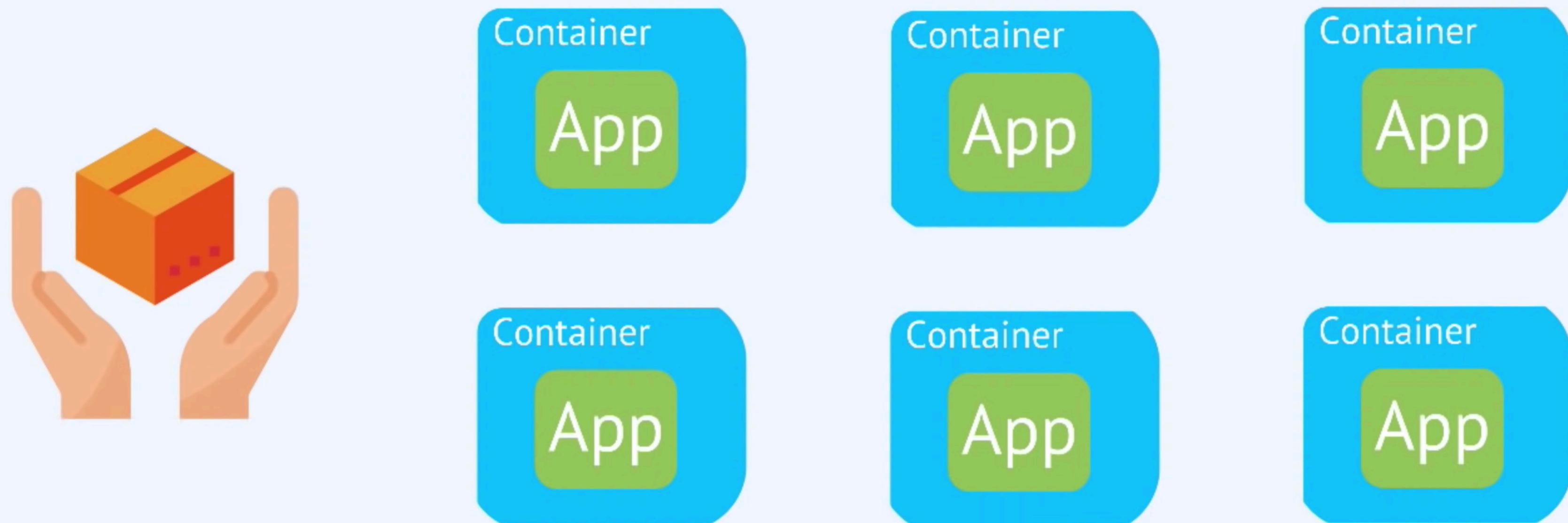


**What **problems** does Kubernetes solve?**

**What are the **tasks** of an orchestration tool?**

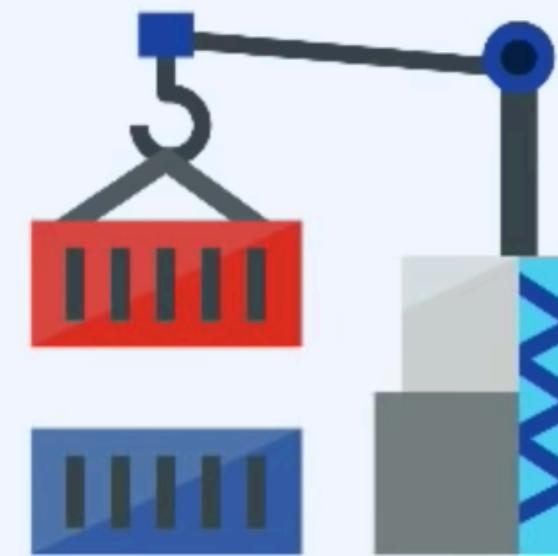
# Need for container orchestration tool

- ▶ Trend from **Monolith** to **Microservices**
- ▶ Increased usage of containers



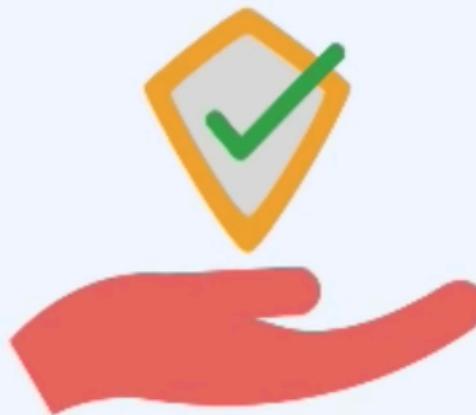
# Need for container orchestration tool

- ▶ Trend from **Monolith** to **Microservices**
- ▶ Increased usage of containers
- ▶ Demand for a **proper way of managing** those hundreds of containers



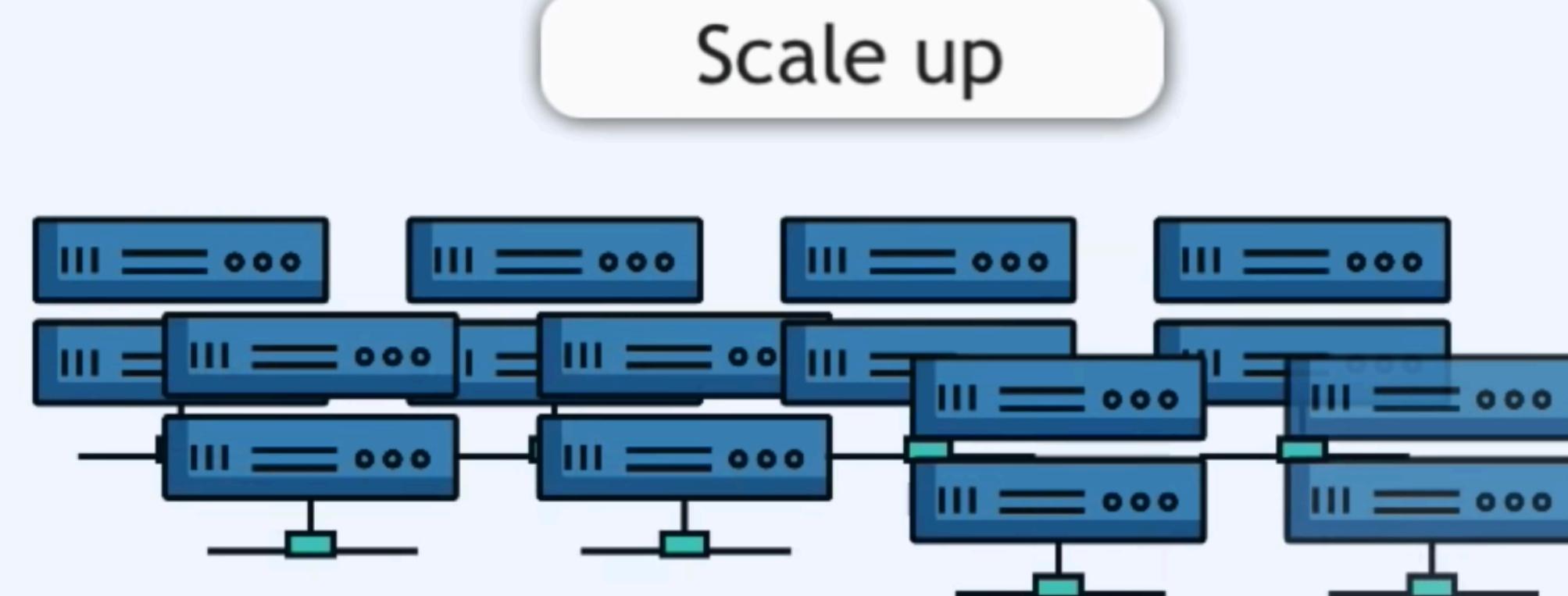
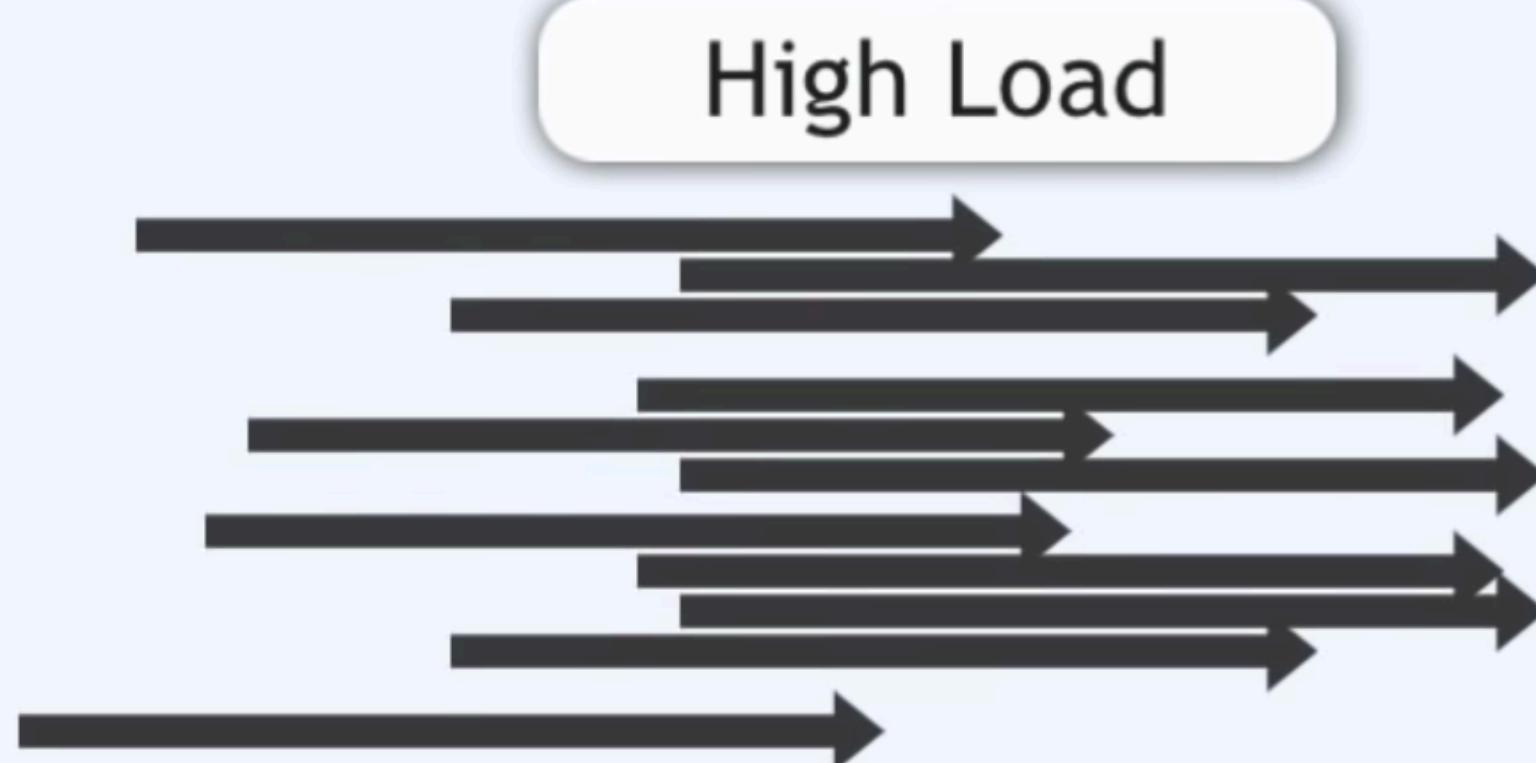
# What features do orchestration tools offer?

- ▶ High **Availability** or no downtime



# What features do orchestration tools offer?

- ▶ High **Availability** or no downtime
- ▶ **Scalability** or high performance



# What features do orchestration tools offer?

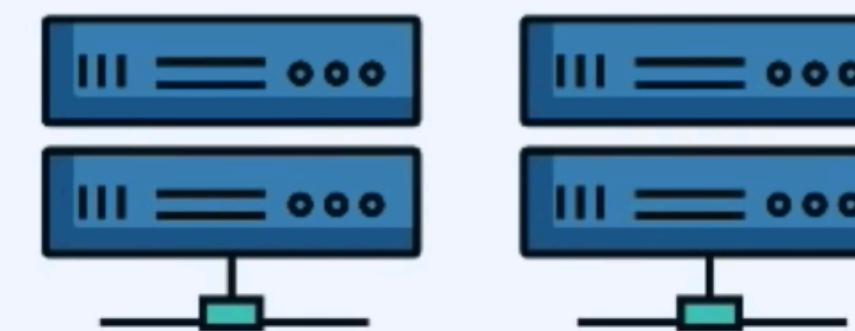
- ▶ High **Availability** or no downtime
- ▶ **Scalability** or high performance



Load decreasing..

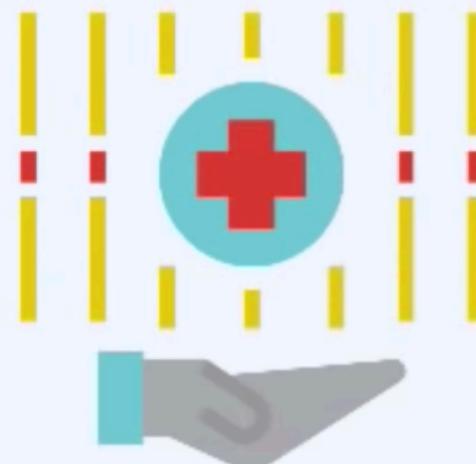


Scale down



# What features do orchestration tools offer?

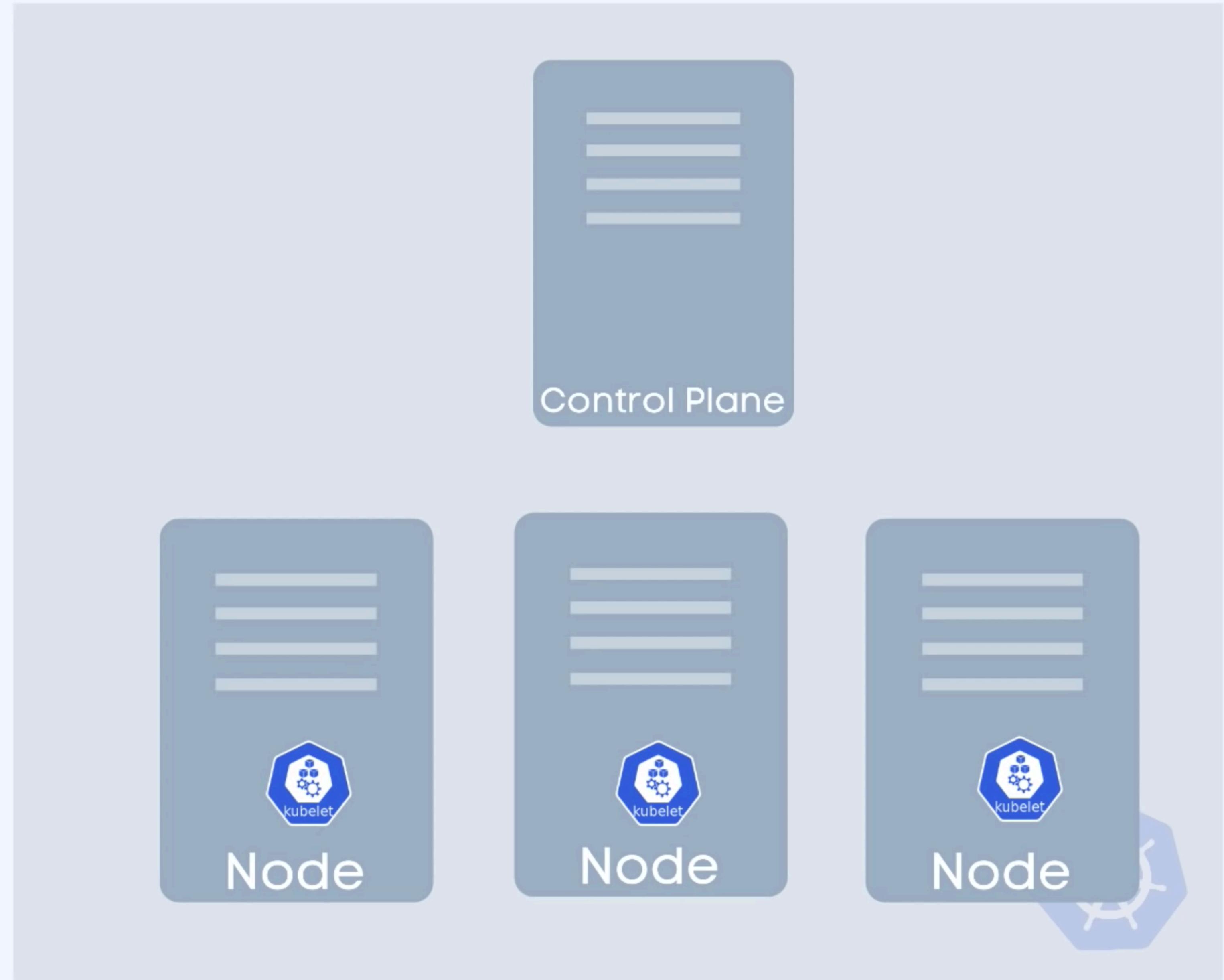
- ▶ High **Availability** or no downtime
- ▶ **Scalability** or high performance
- ▶ **Disaster recovery** - backup and restore



# Kubernetes Architecture



primary "node agent"





**API Server** =  
Entrypoint to K8s cluster



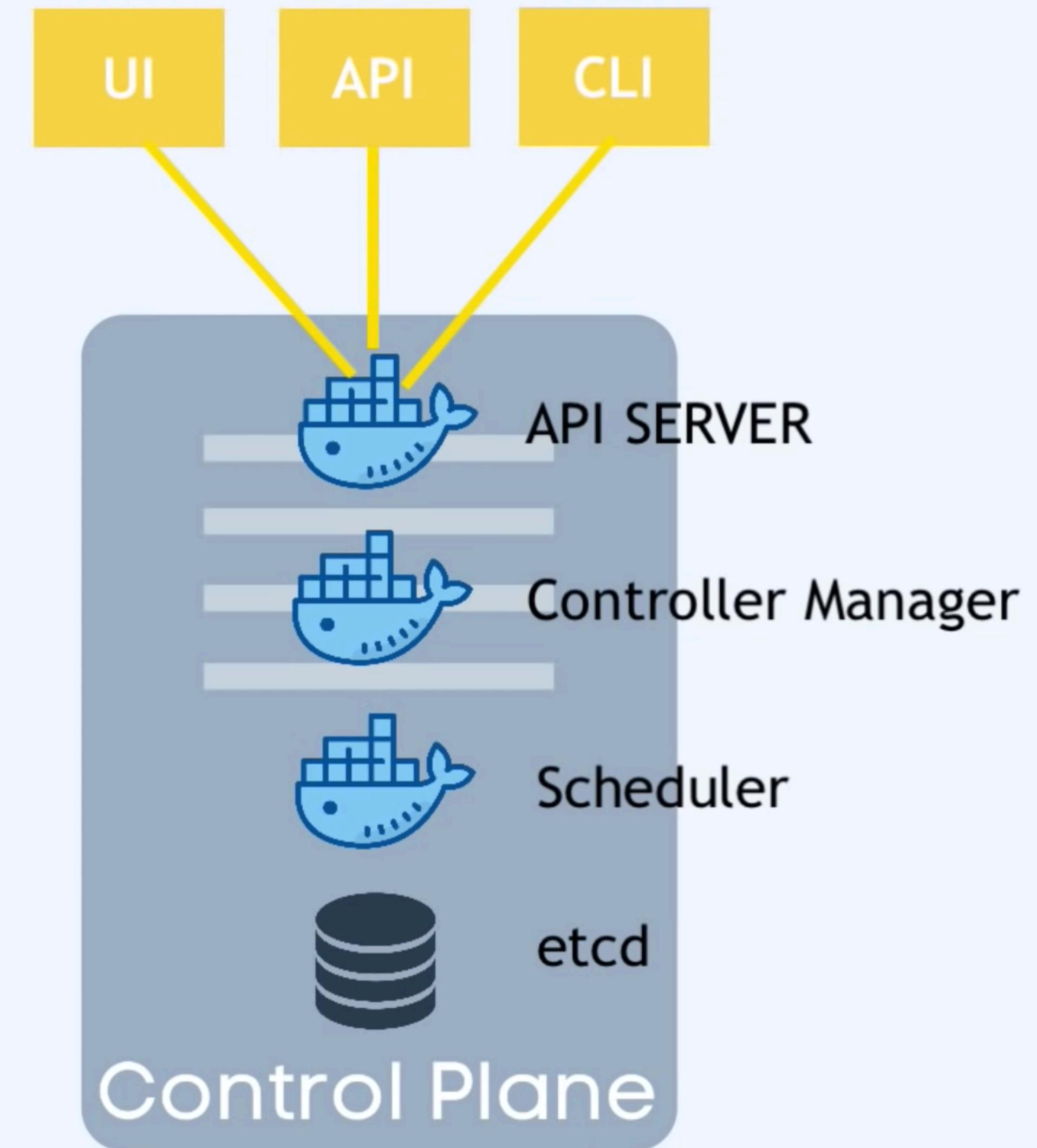
**Controller Manager** = keeps track of  
what's happening in the cluster



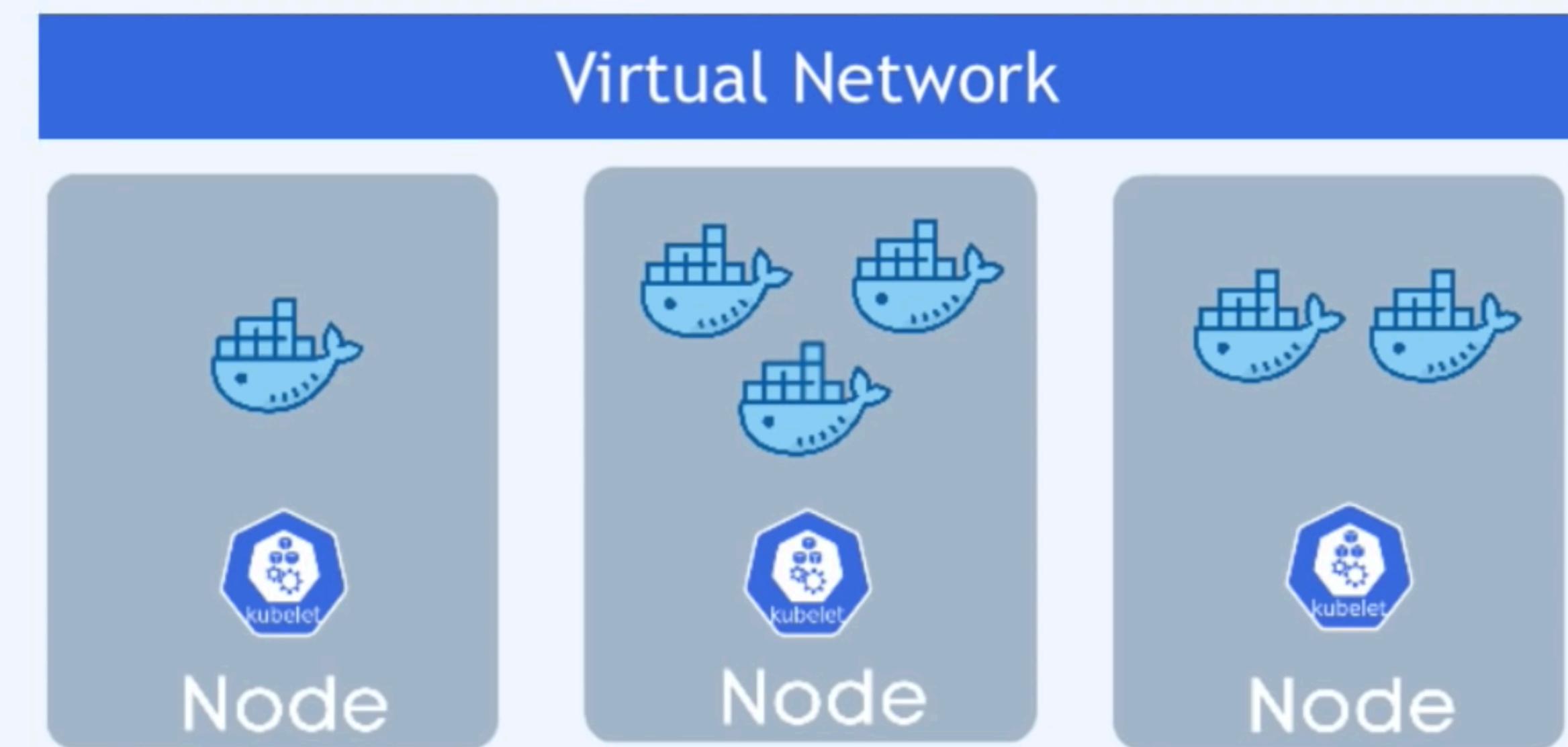
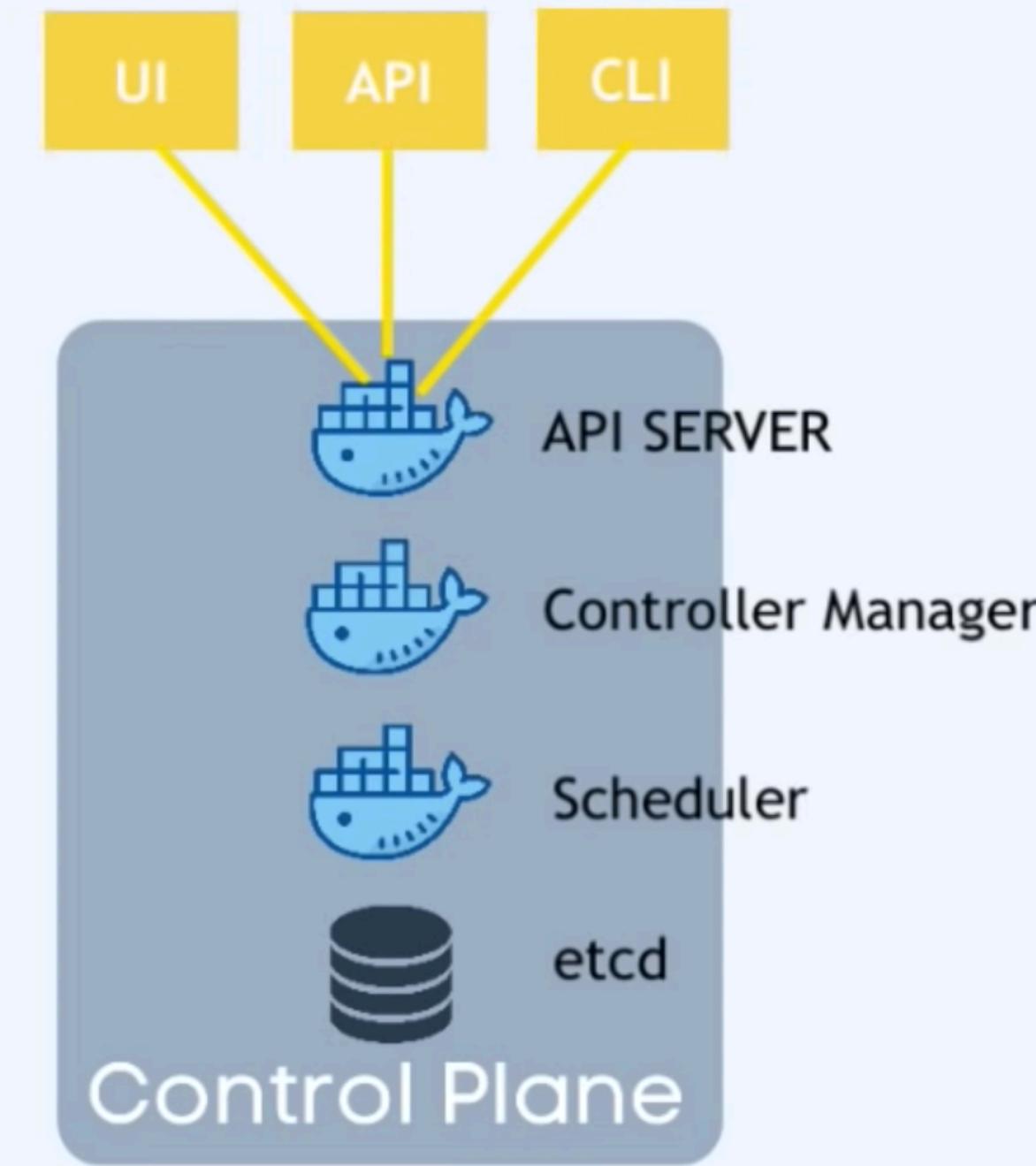
**Scheduler** =  
ensures Pods placement



**etcd** =  
Kubernetes backing store



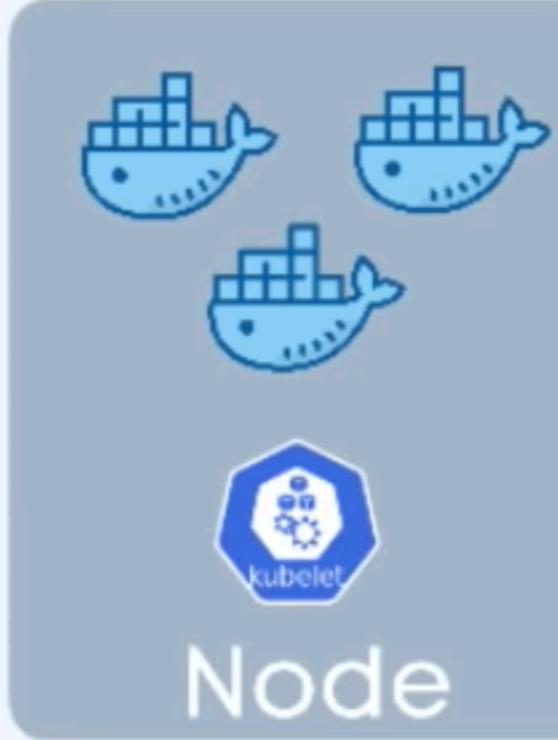
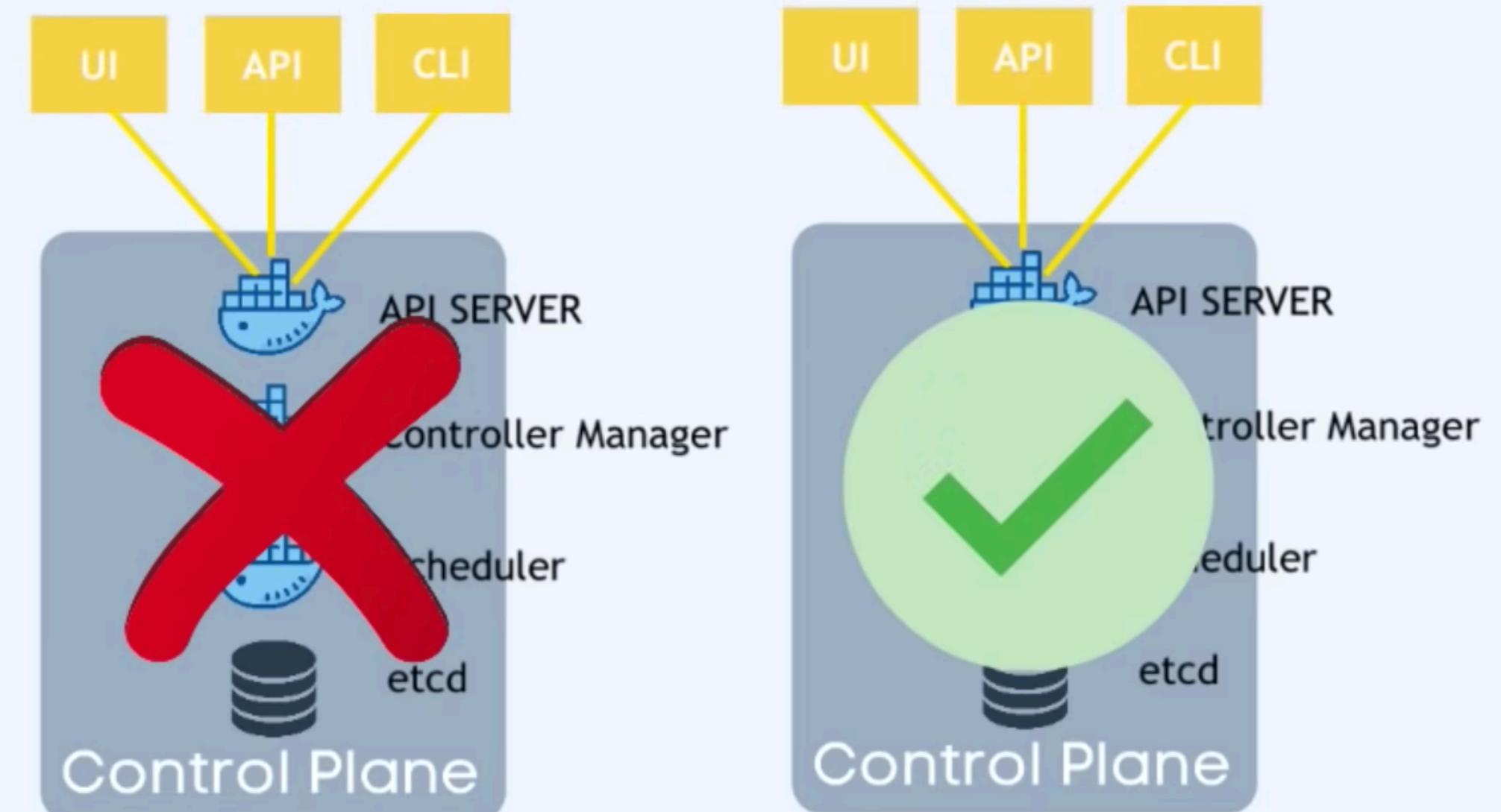
**Virtual Network =**  
Creates one unified machine



## Control Plane Nodes

handful of master processes

much more important

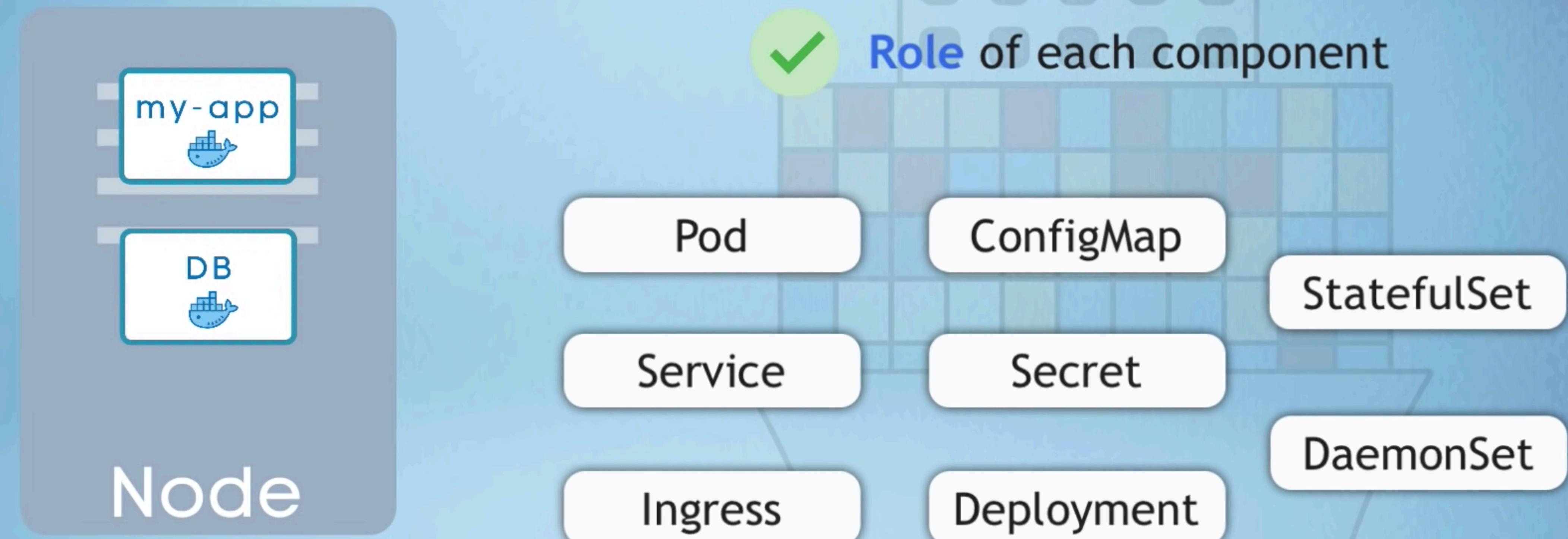


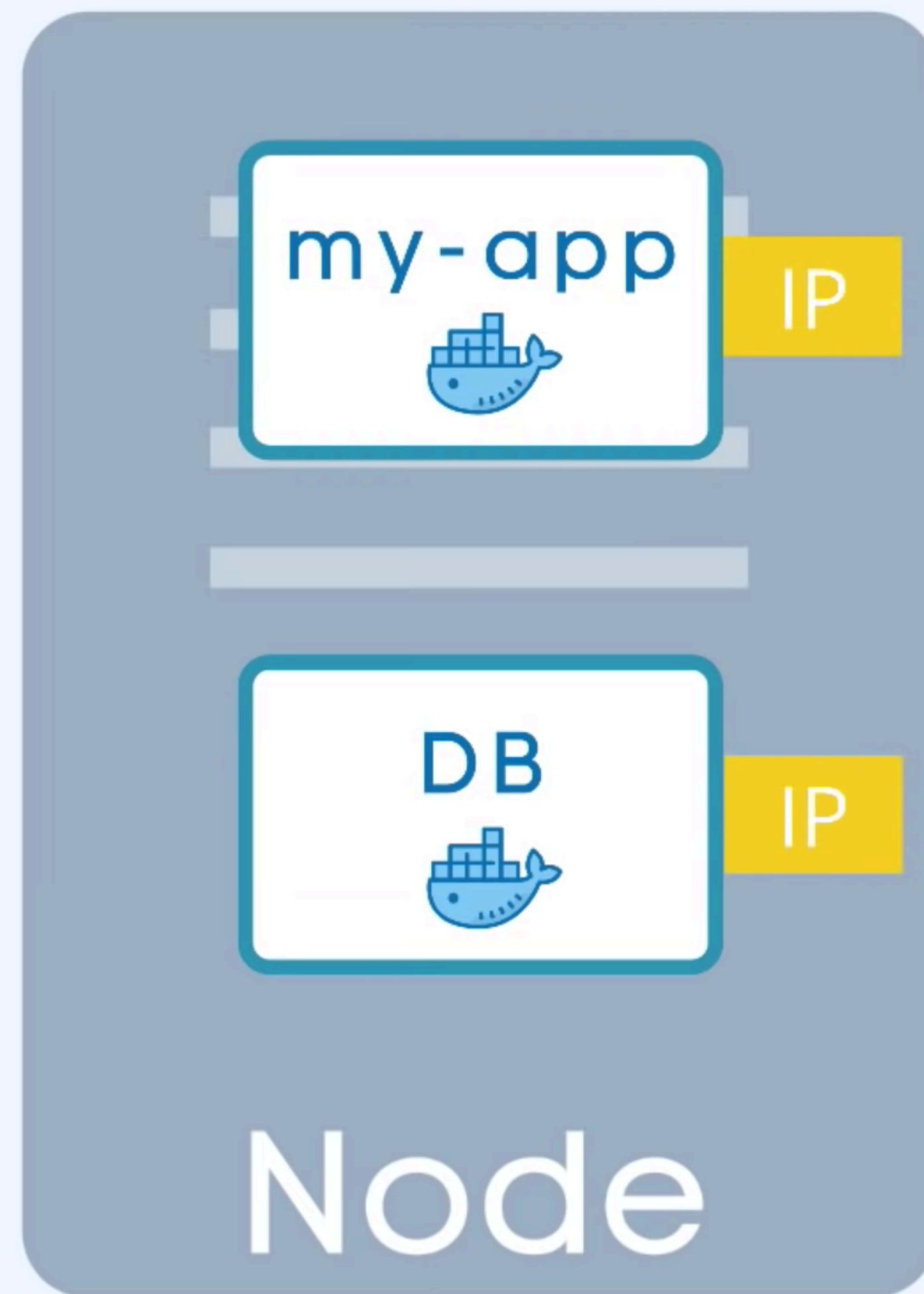
## Worker Nodes

higher workload

much bigger and more resources

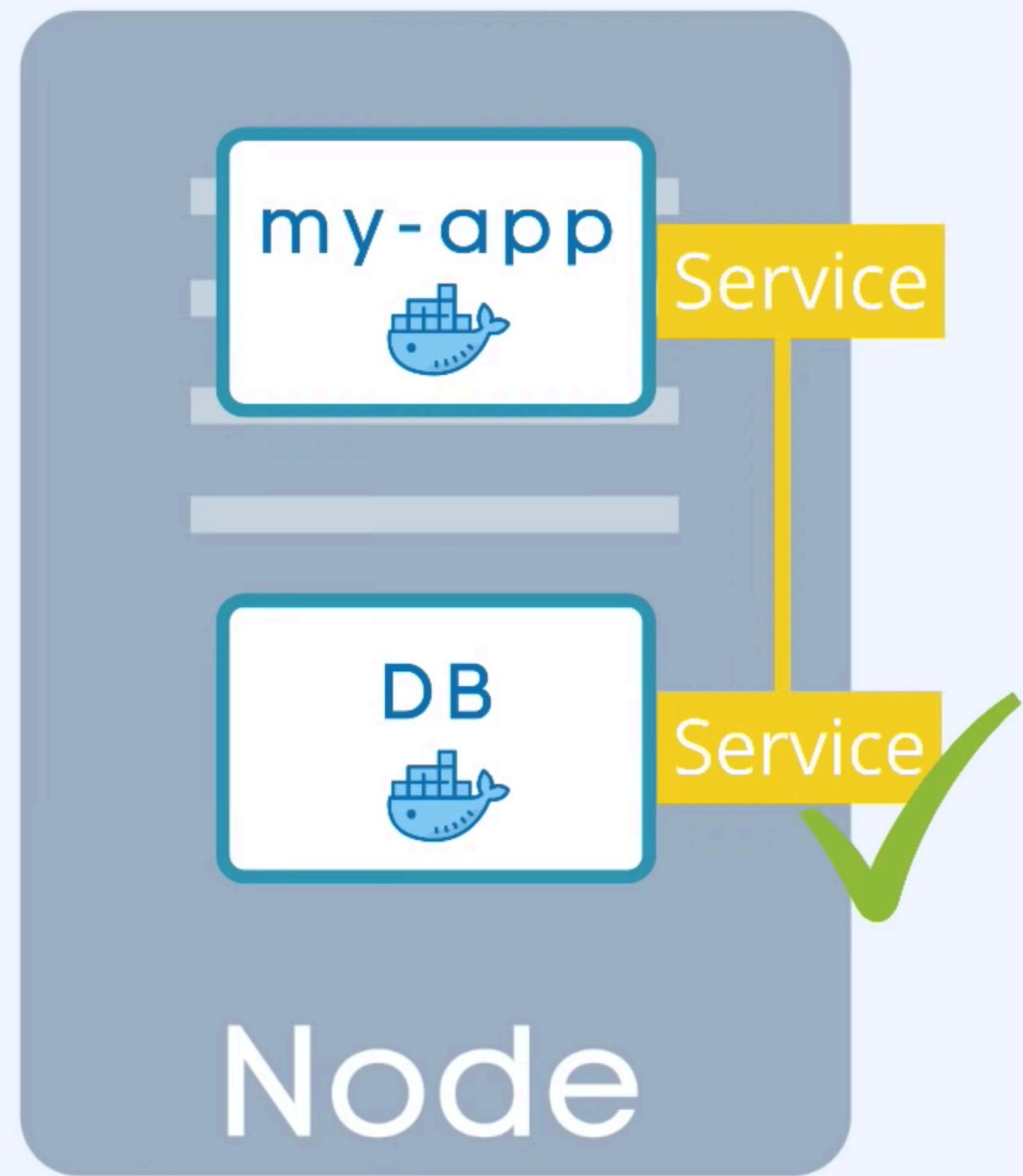
# Main Kubernetes Components





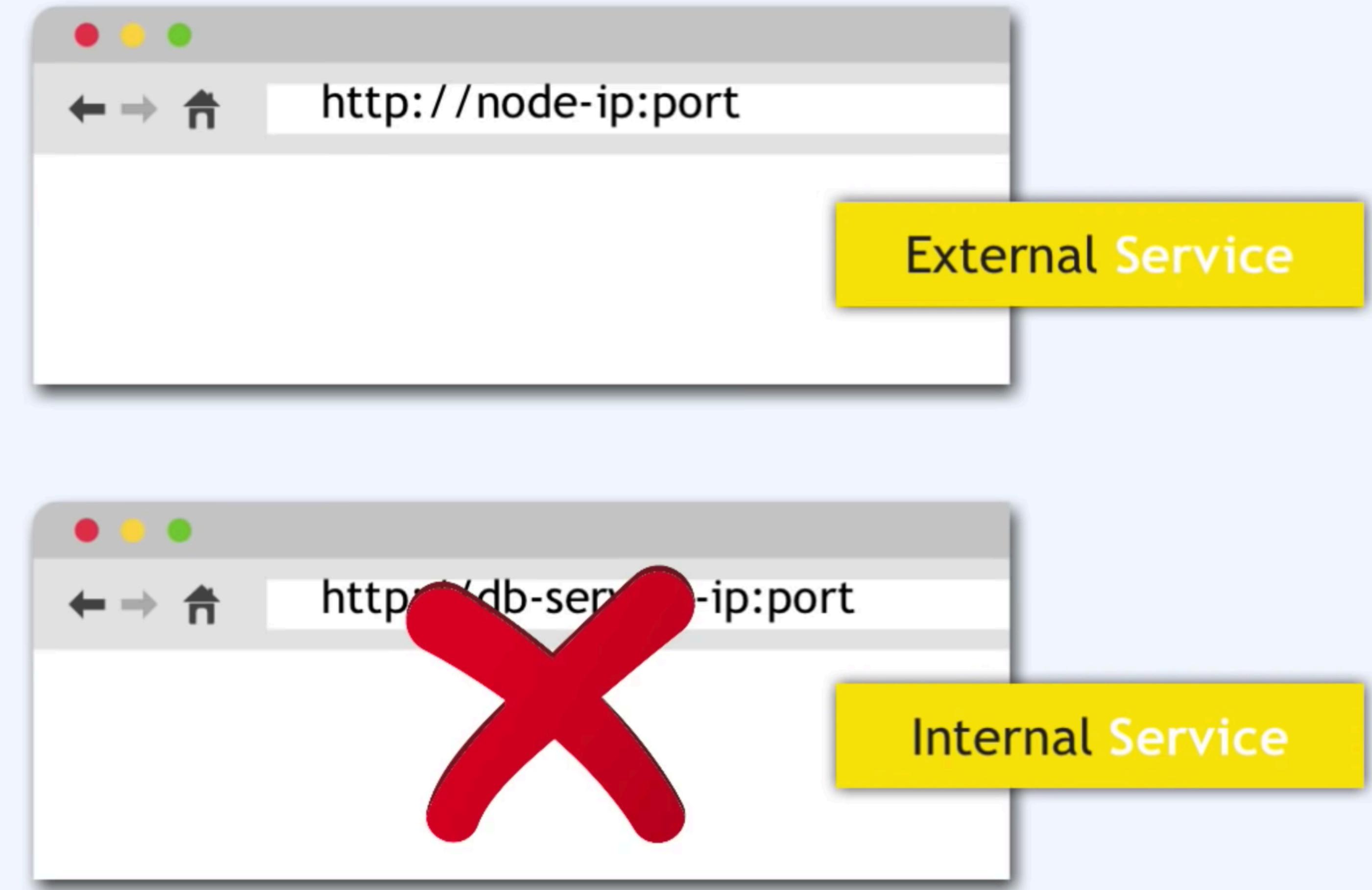
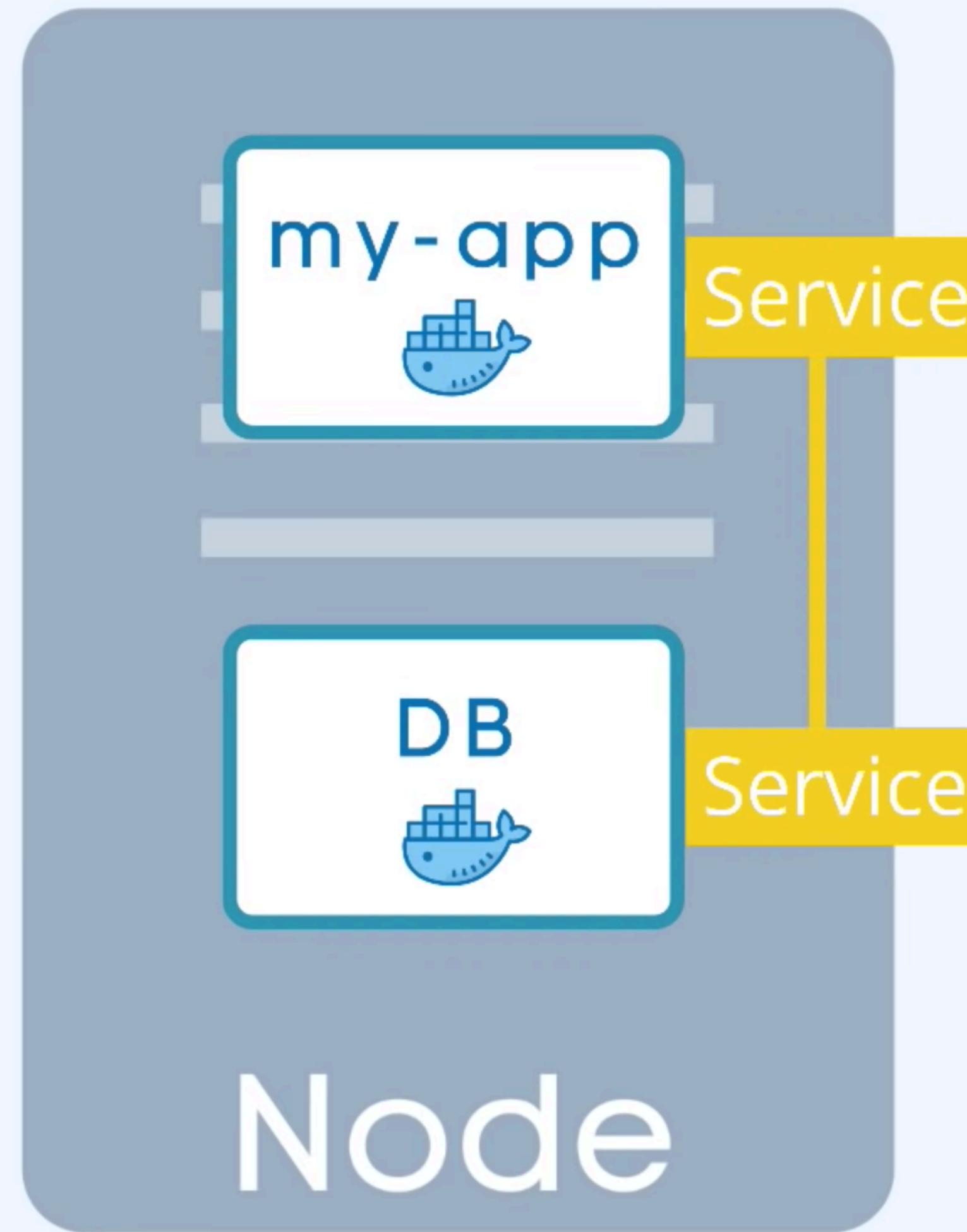
- ▶ **Smallest** unit in Kubernetes
- ▶ **Abstraction** over container
- ▶ Usually **1 Application** per Pod
- ▶ Each Pod gets its **own IP address**
- ▶ **New IP address** on re-creation



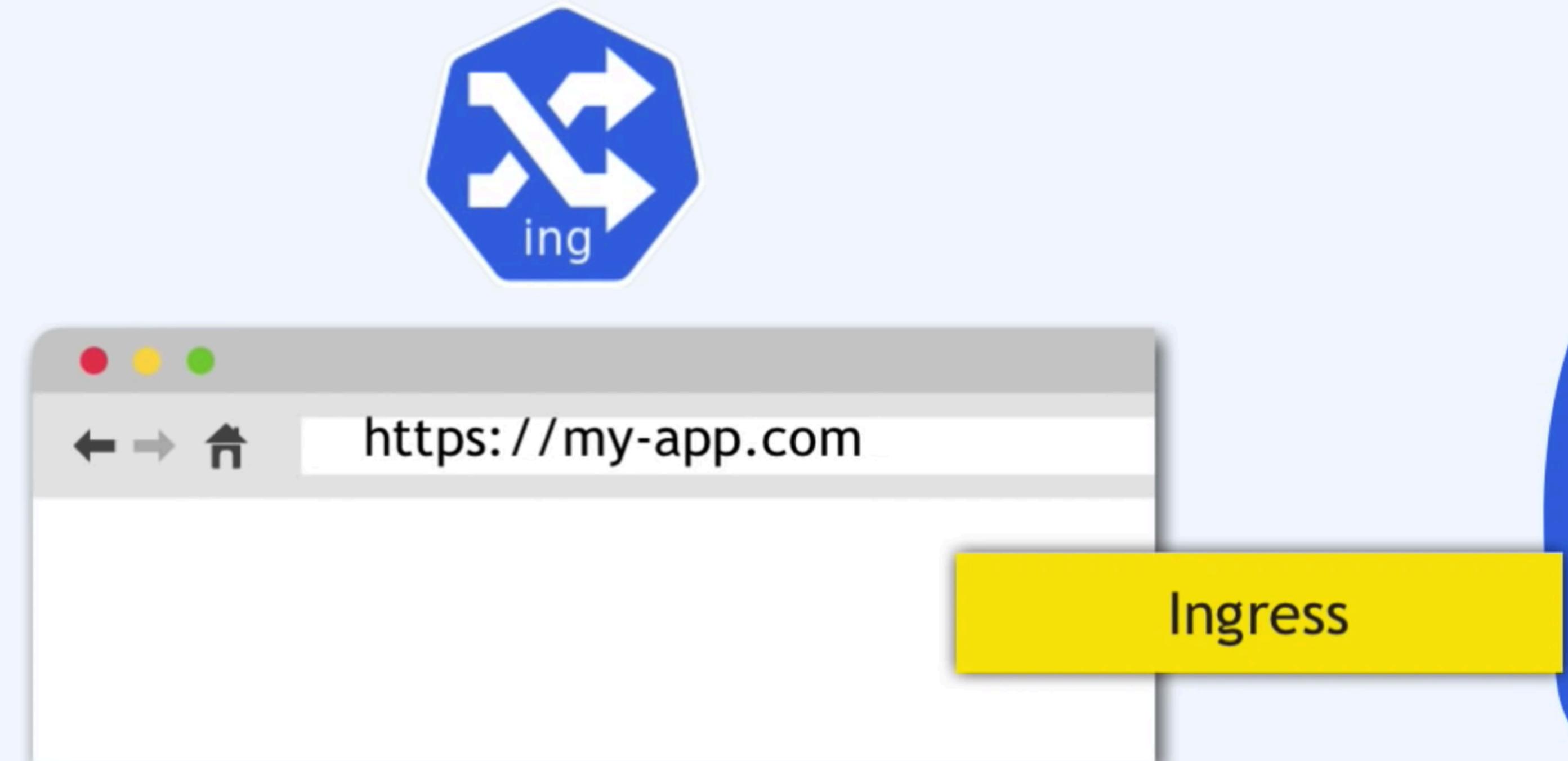
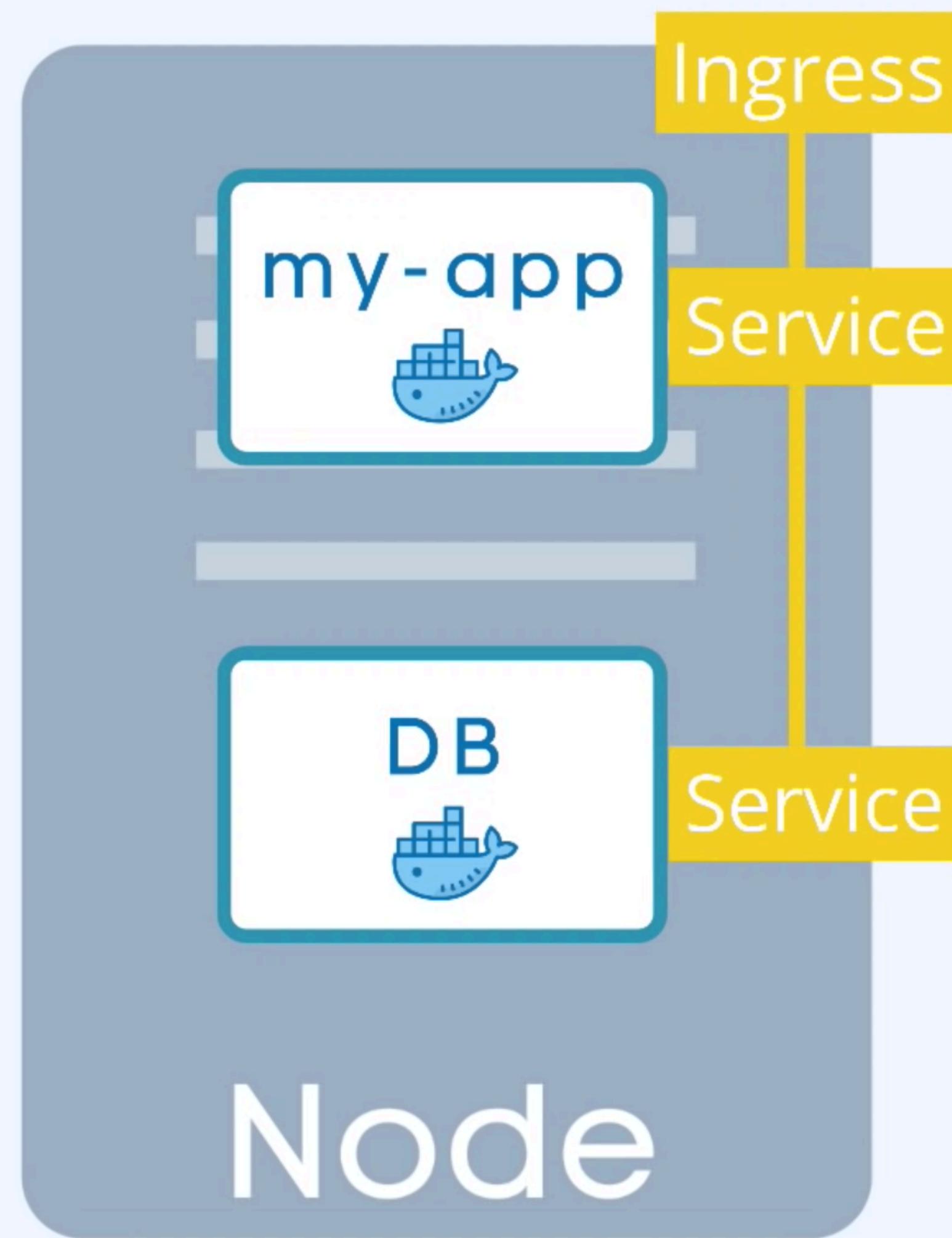


- ▶ Permanent IP address
- ▶ Lifecycle of Pod and Service  
not connected

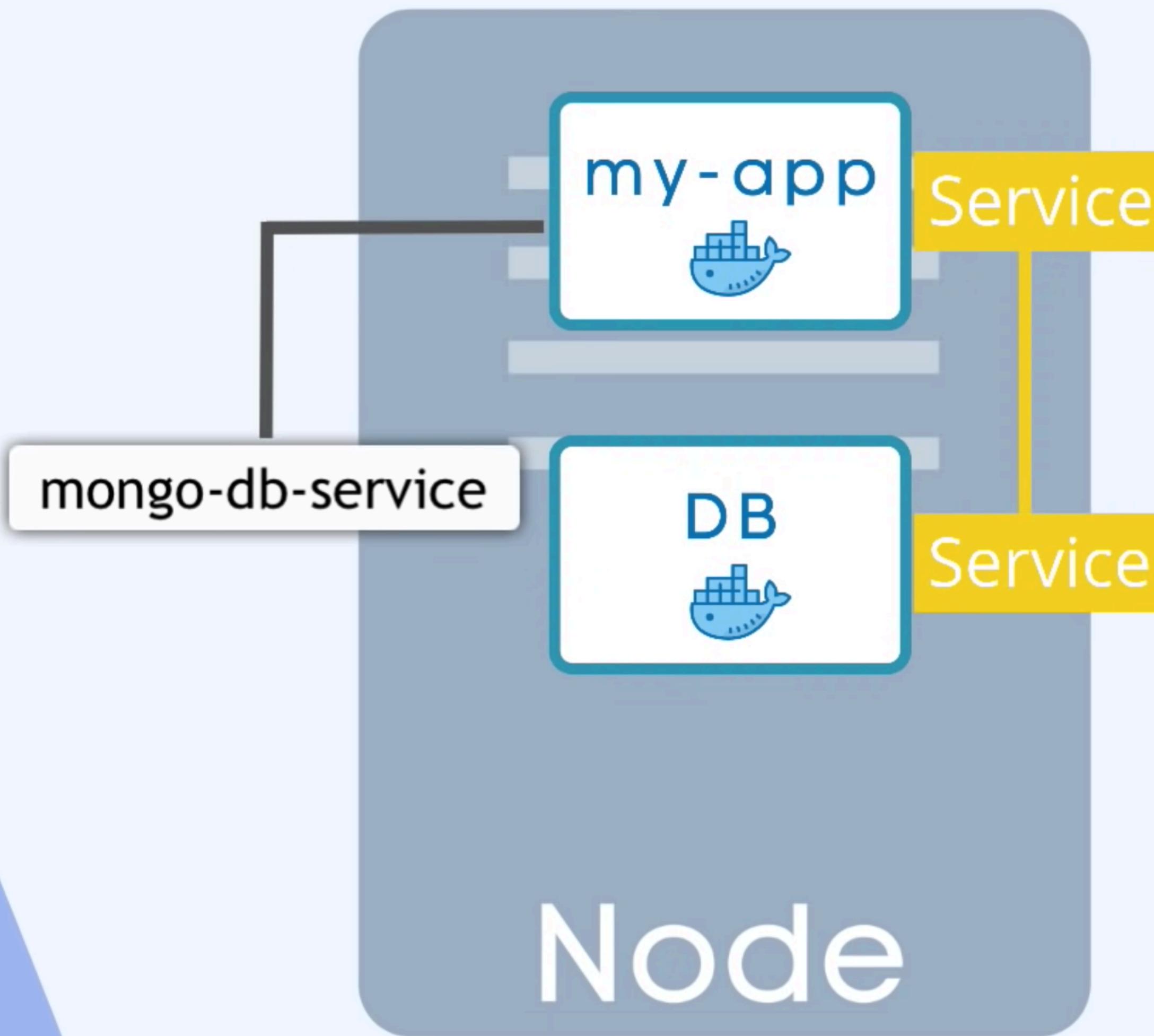




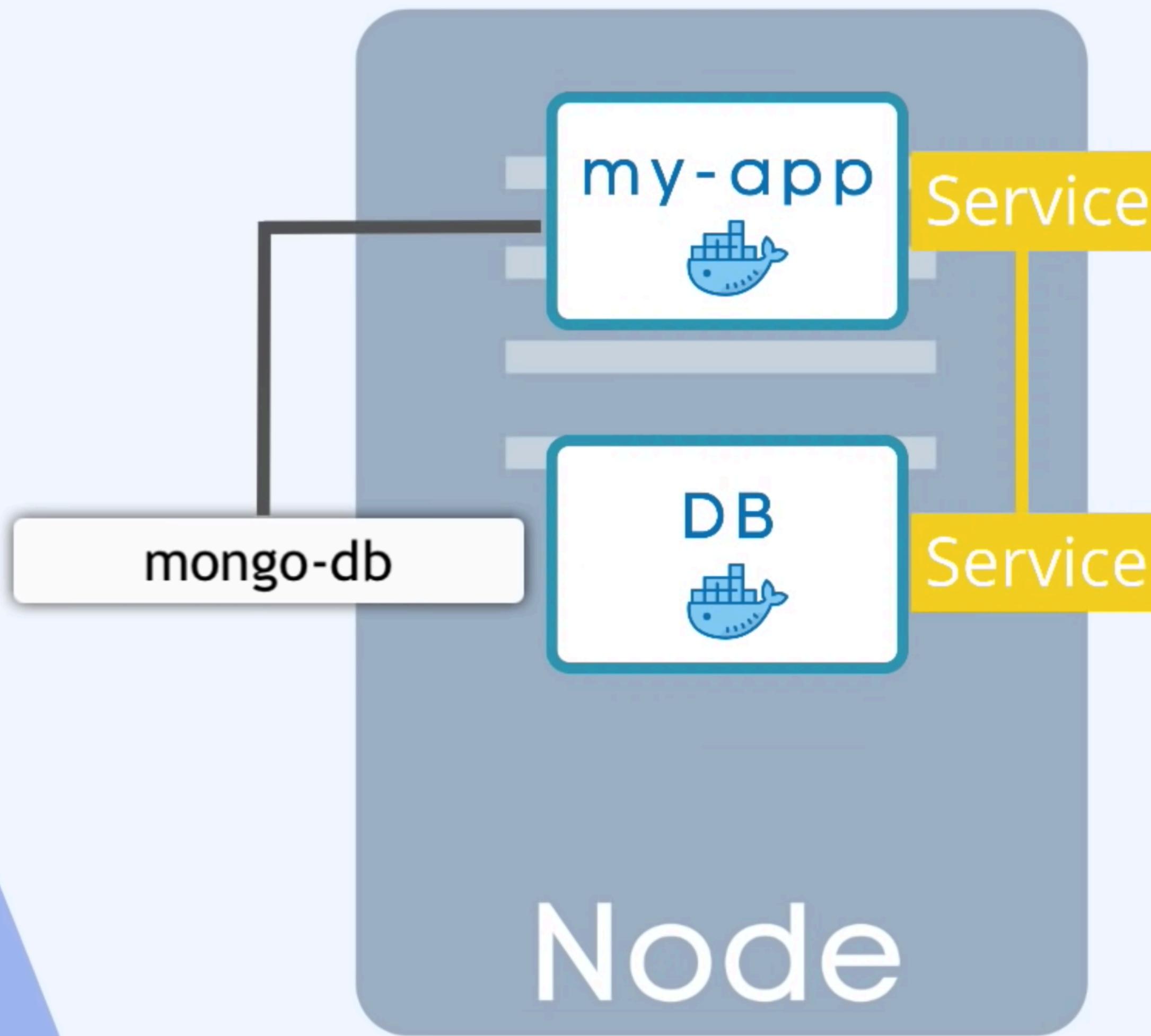
- ▶ You specify the **type of Service** on creation
- ▶ Internal Service is the **default** type



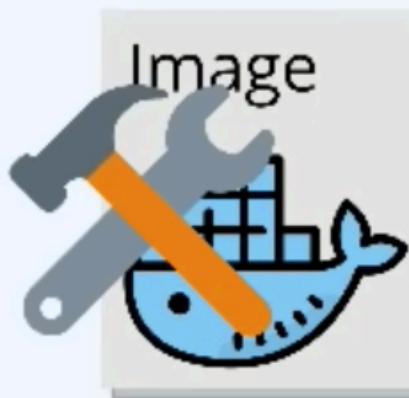
Database URL usually in the  
**built** application!

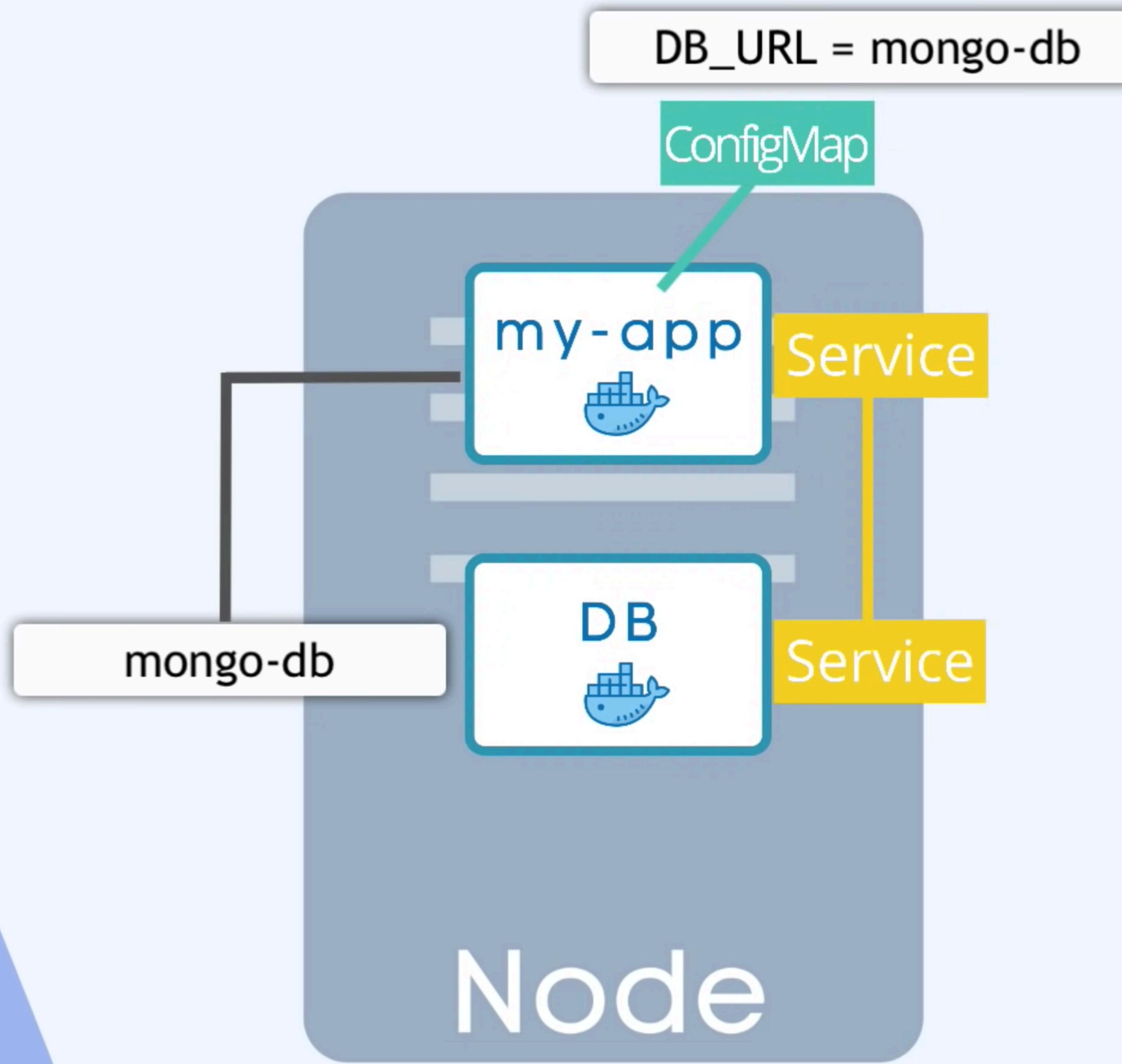


Database URL usually in the  
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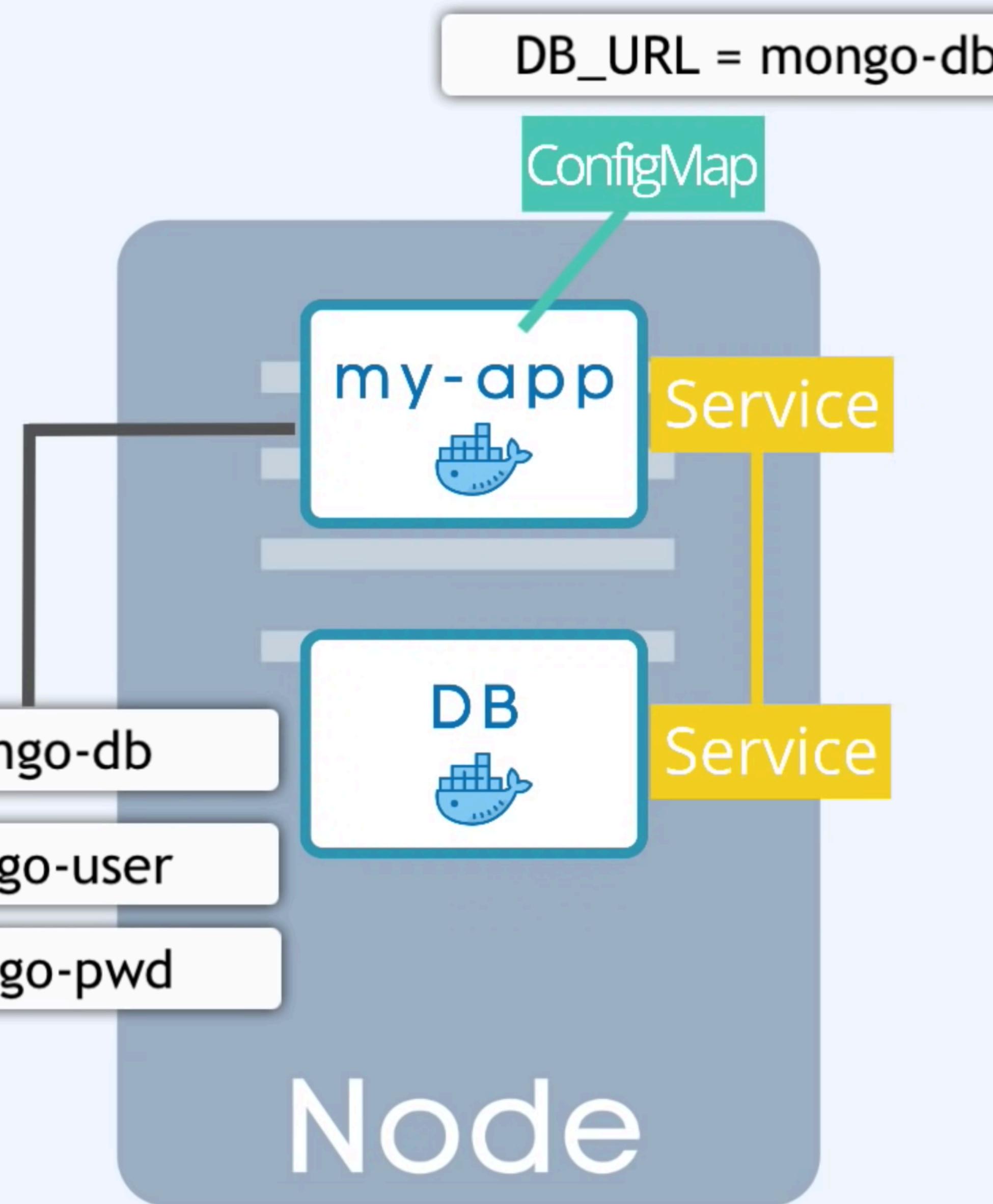
- Re-build
- Push it to repo
- Pull it in your Pod





- ▶ External Configuration of your application

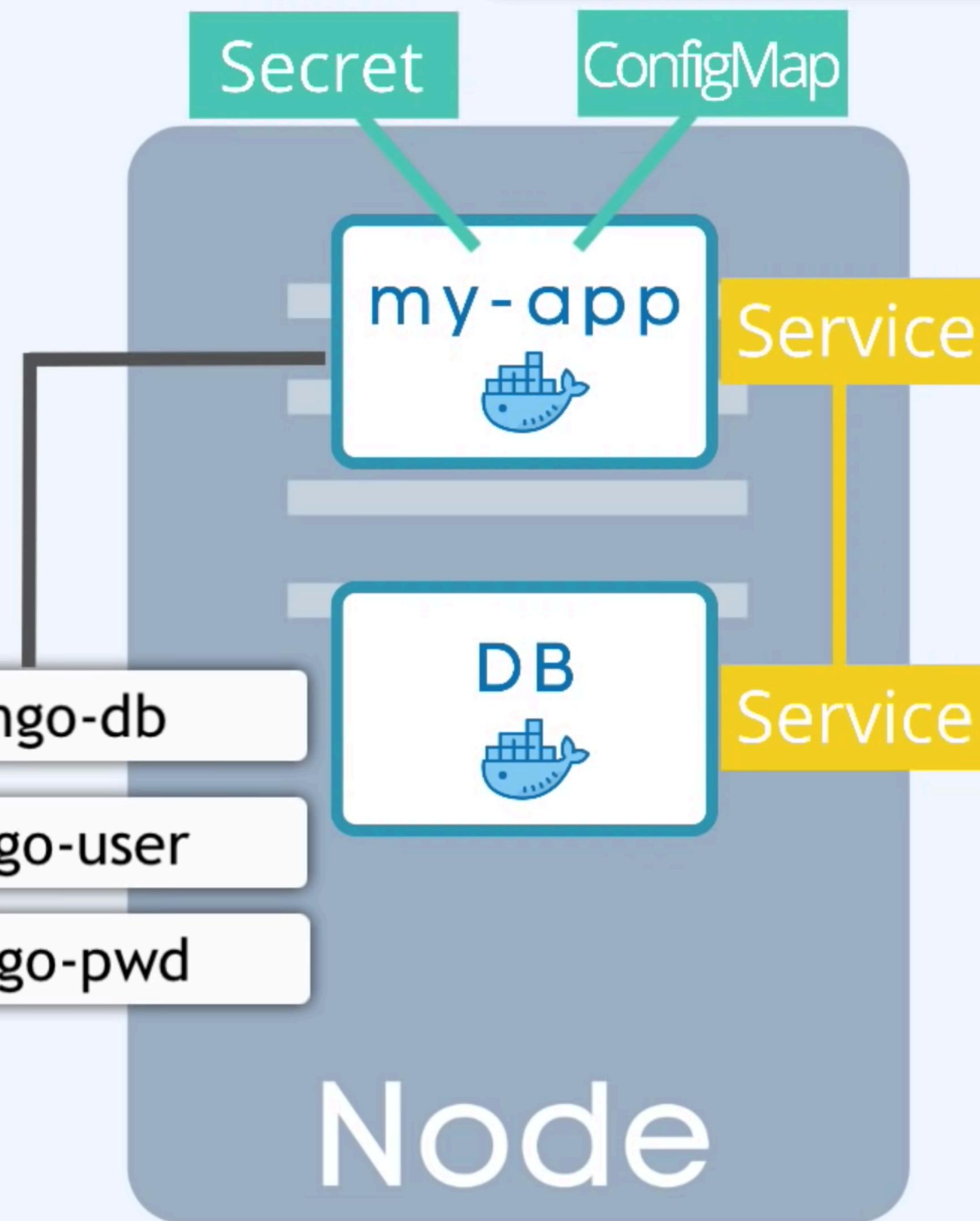




! ConfigMap is for non-confidential  
data only!

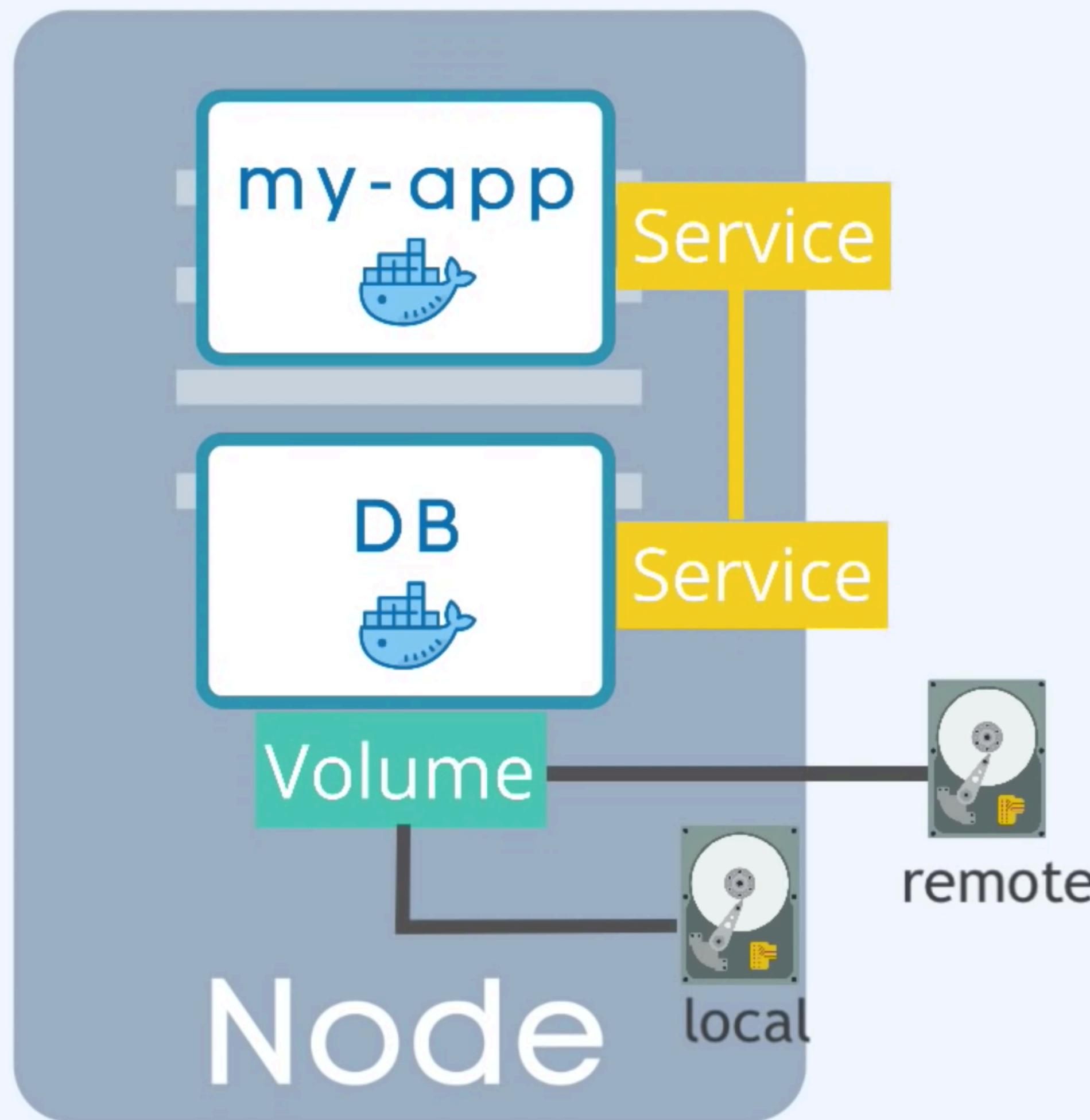
DB\_USER = mongo-user  
DB\_PWD = mongo-pwd

DB\_URL = mongo-db

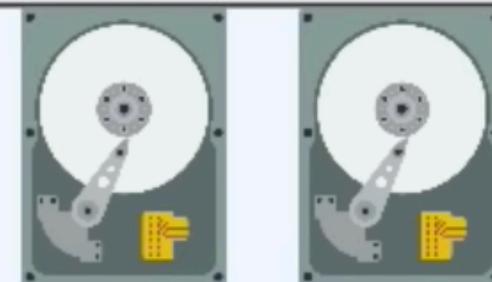


- ▶ Used to store **secret data**
- ▶ Reference Secret in Deployment/Pod

💡 Use it as environment variables  
or as a properties file

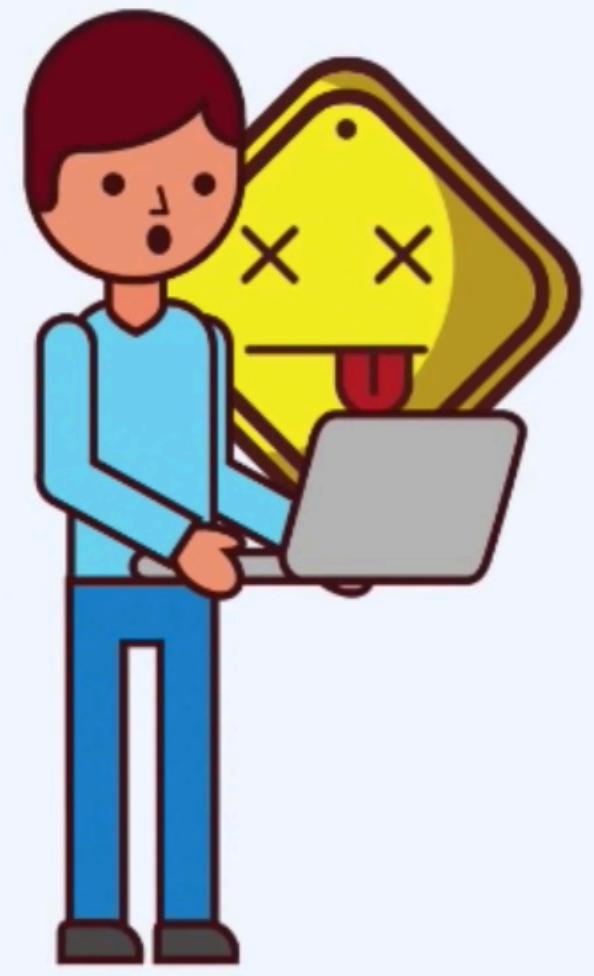
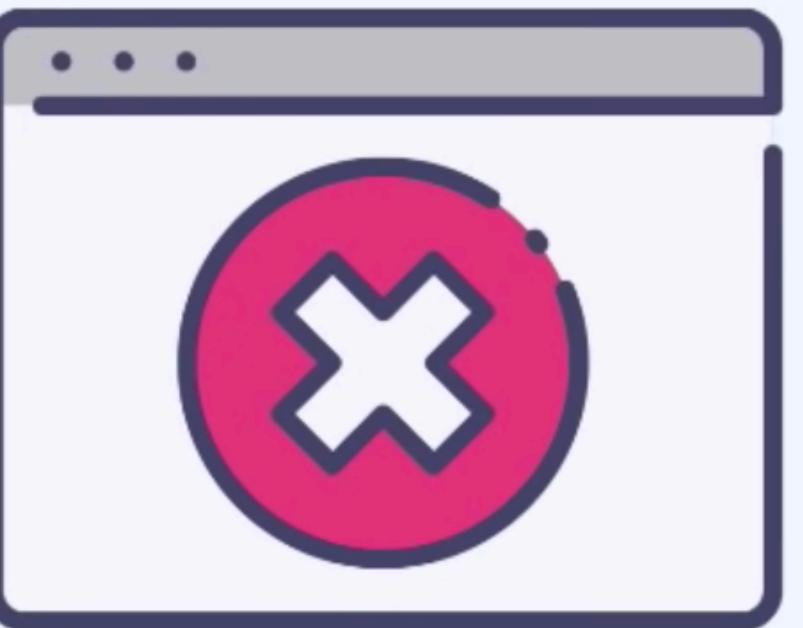
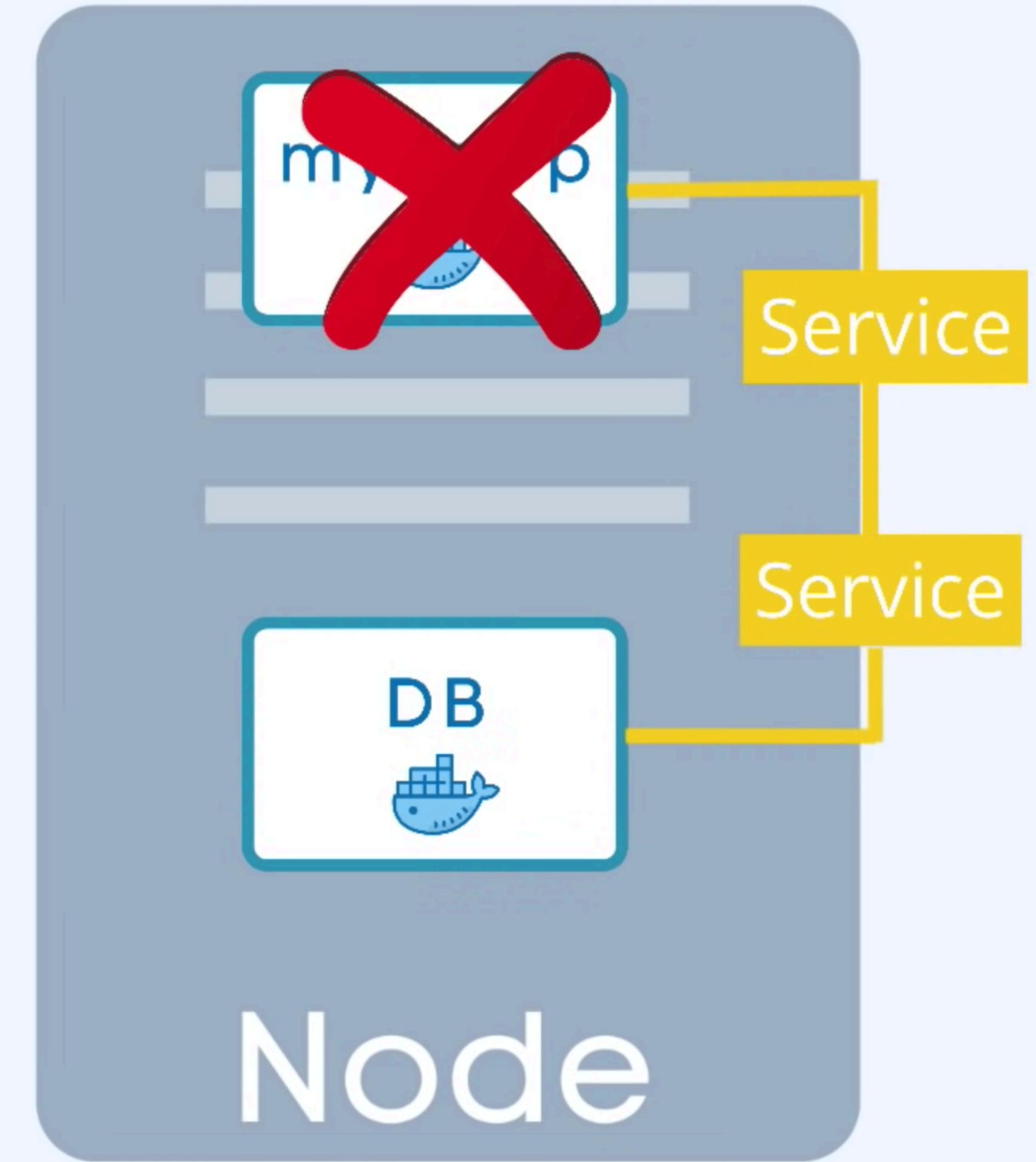


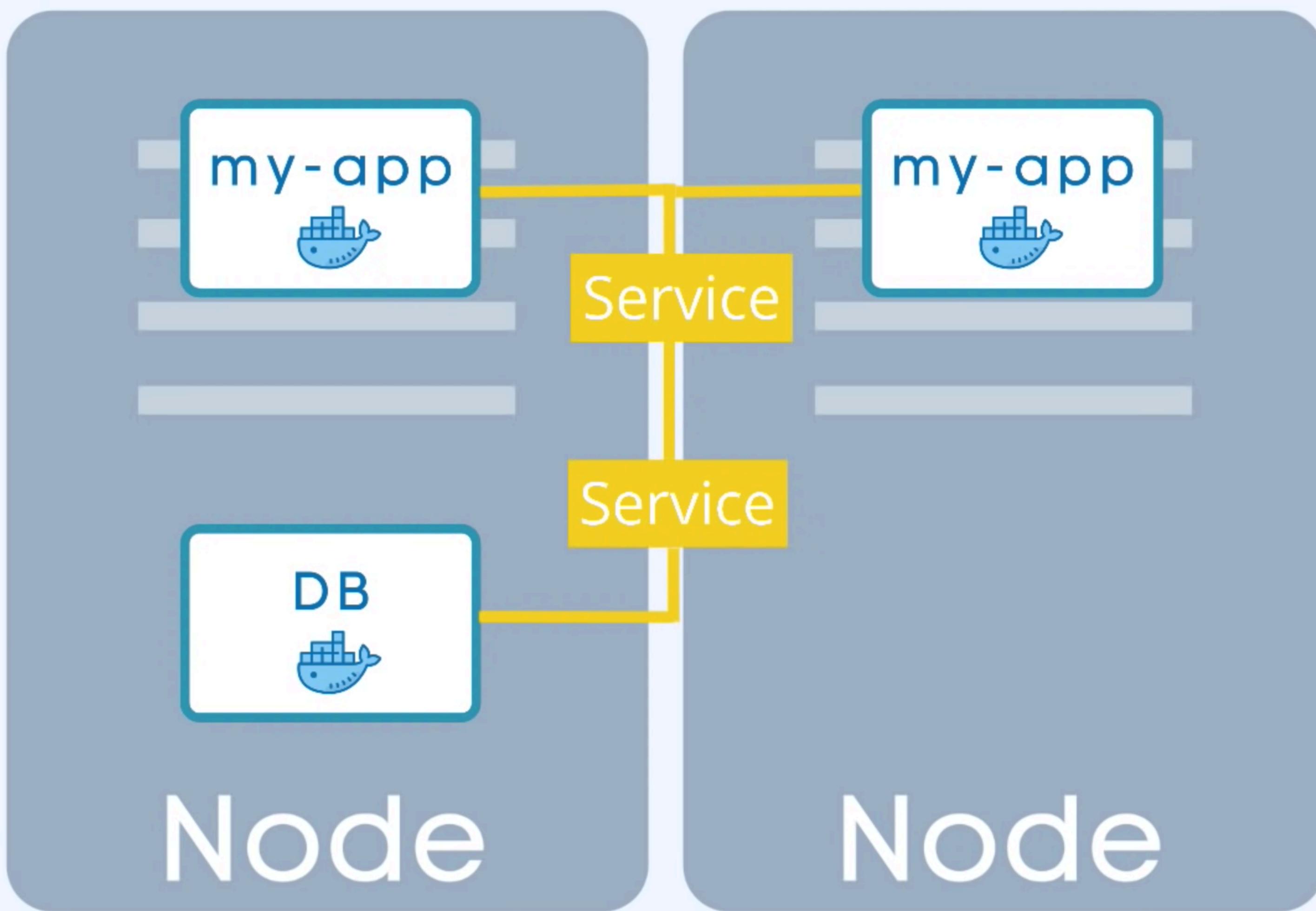
## Kubernetes Cluster



## Storage

! Kubernetes doesn't manage data persistiance!

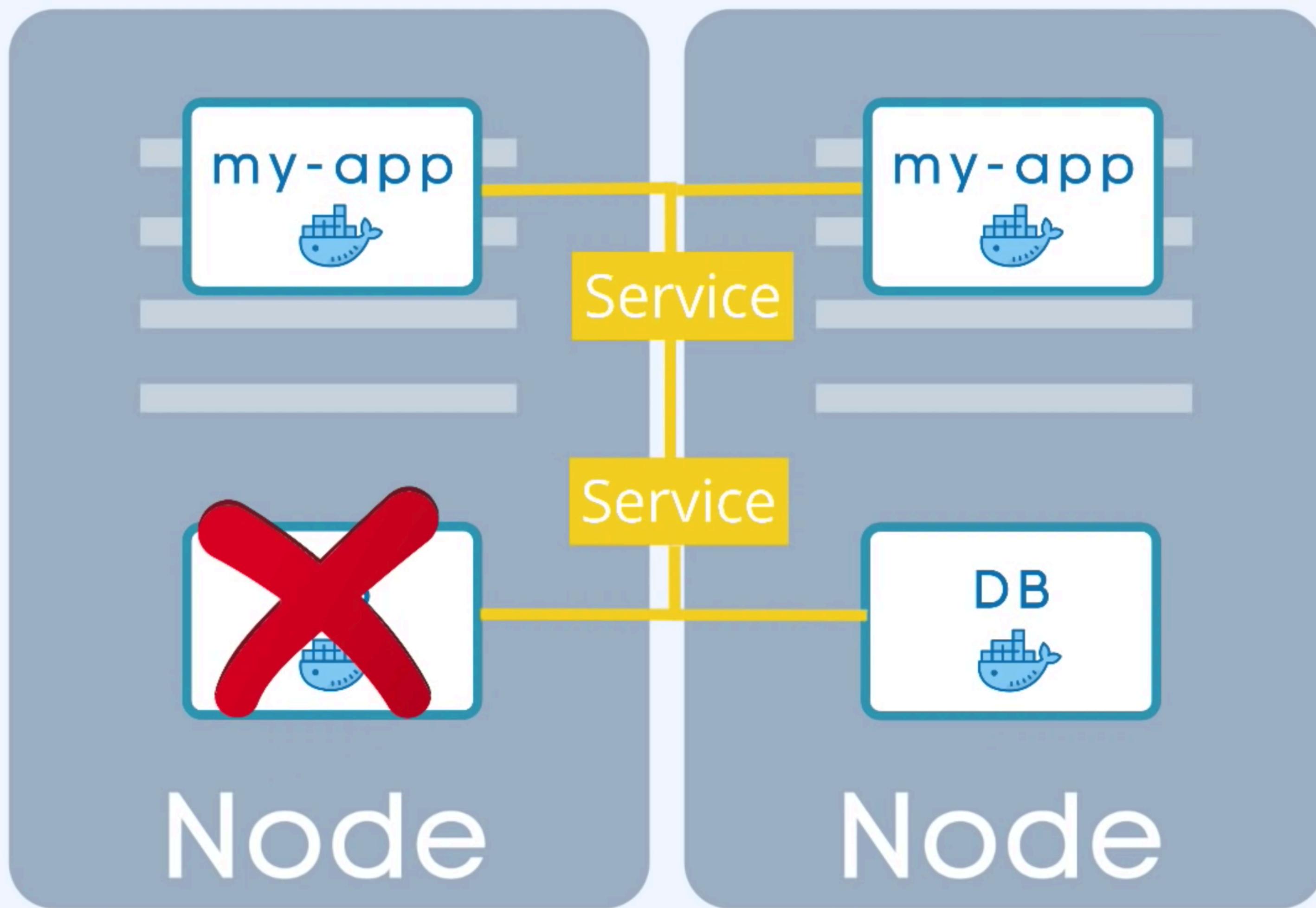




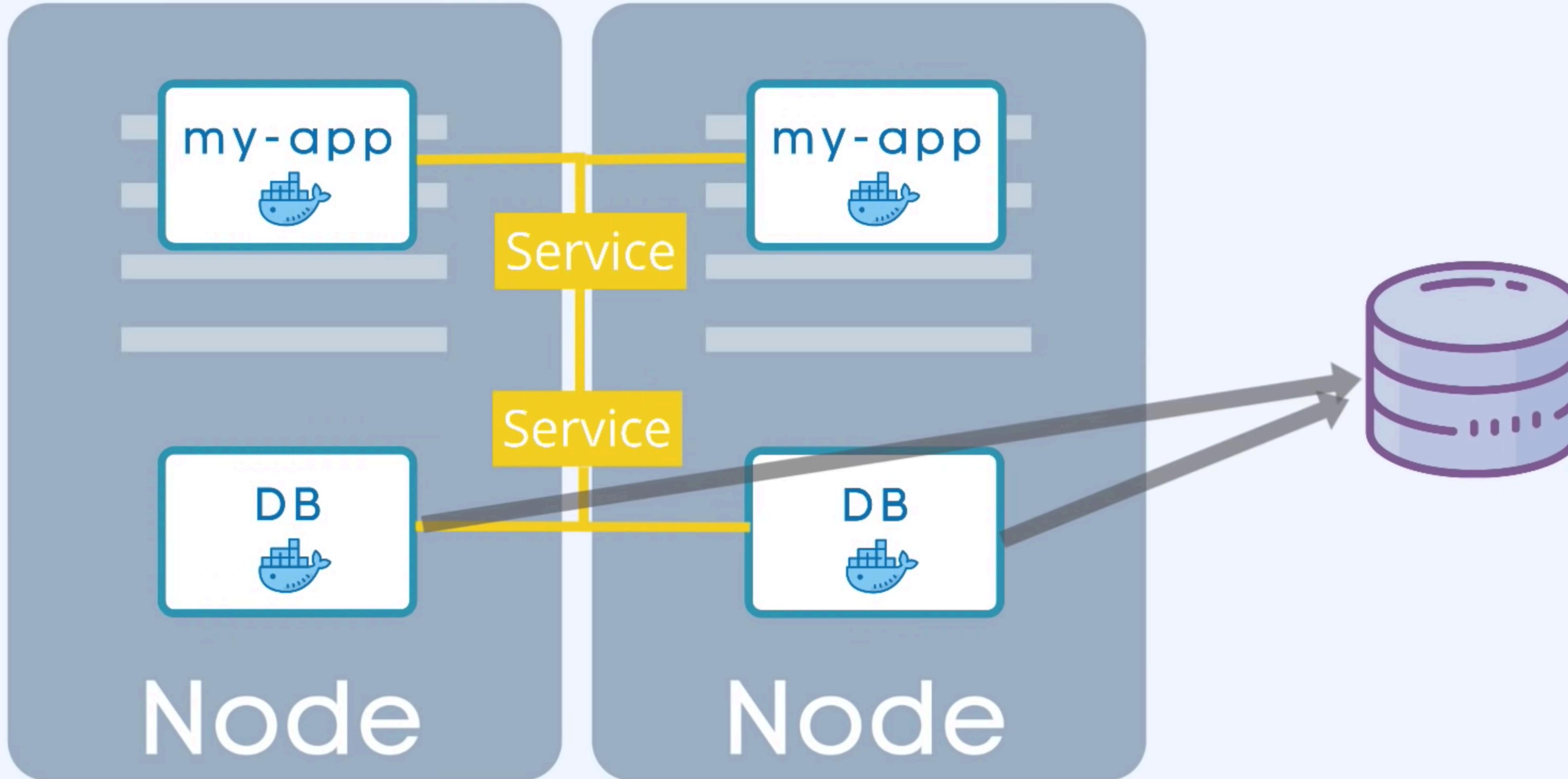
## DEPLOYMENT

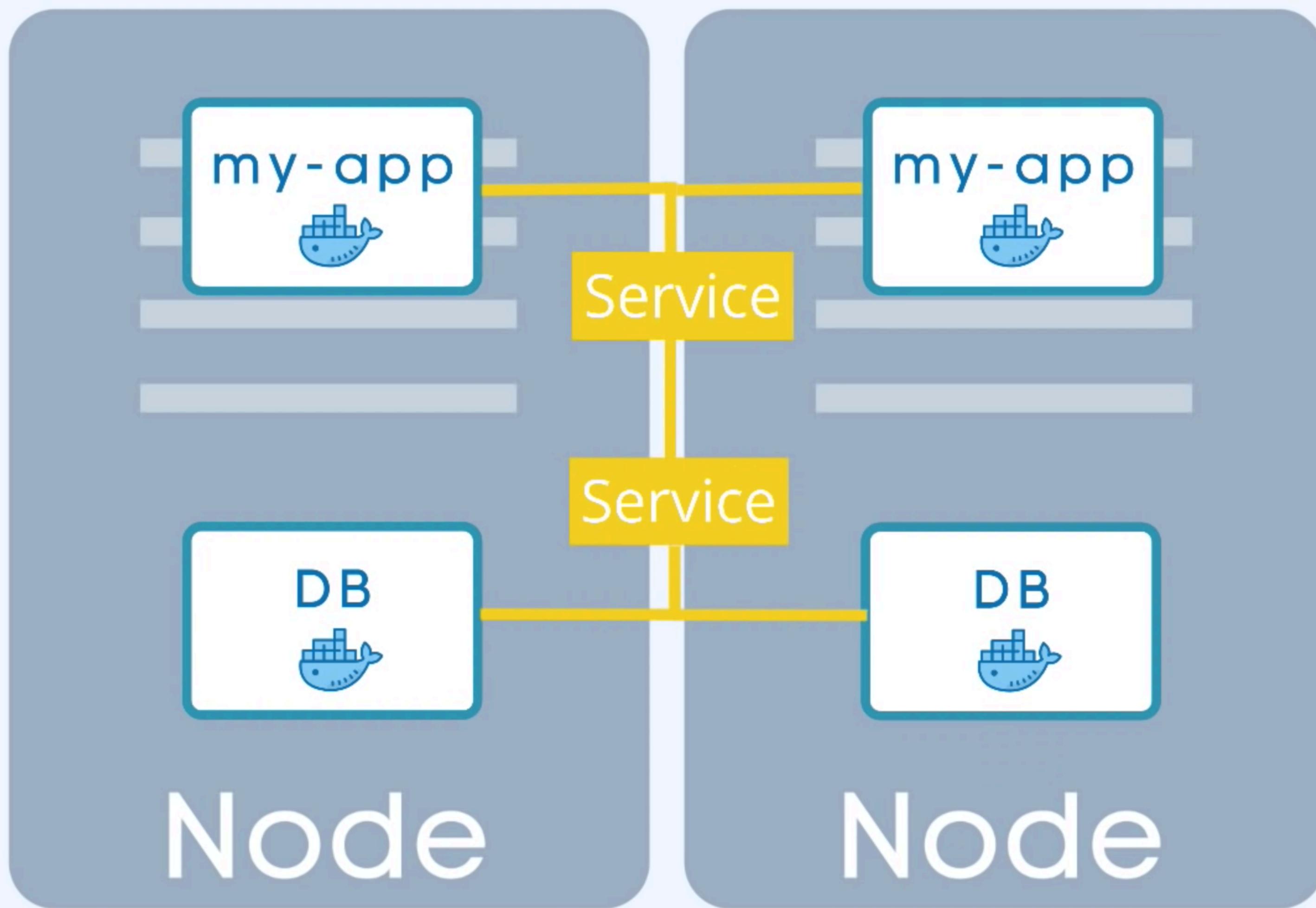


- ▶ Blueprint for "my-app" Pods
- ▶ You create Deployments
- ▶ Abstraction of Pods



! DB can't be replicated via  
Deployment!





**Deployment** =  
for stateLESS Apps

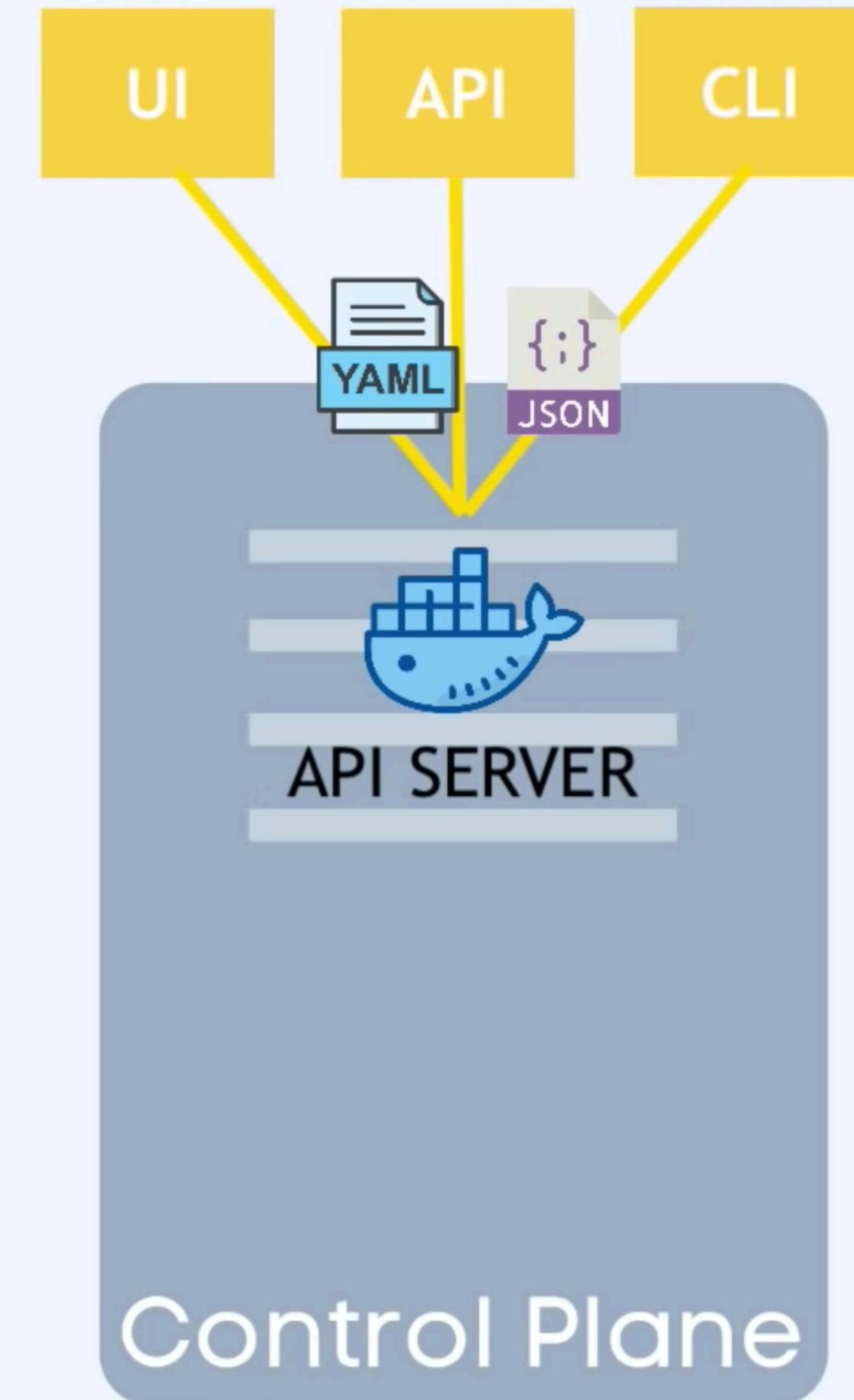
**StatefulSet** =  
for stateFUL Apps or Databases

# Kubernetes Configuration



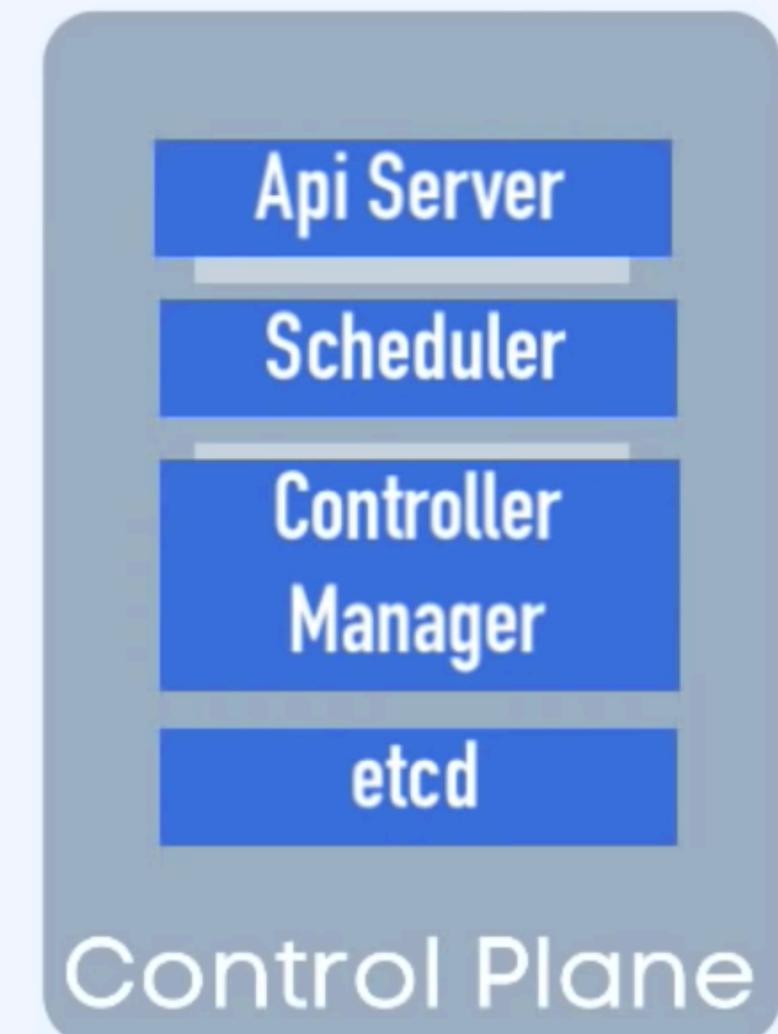
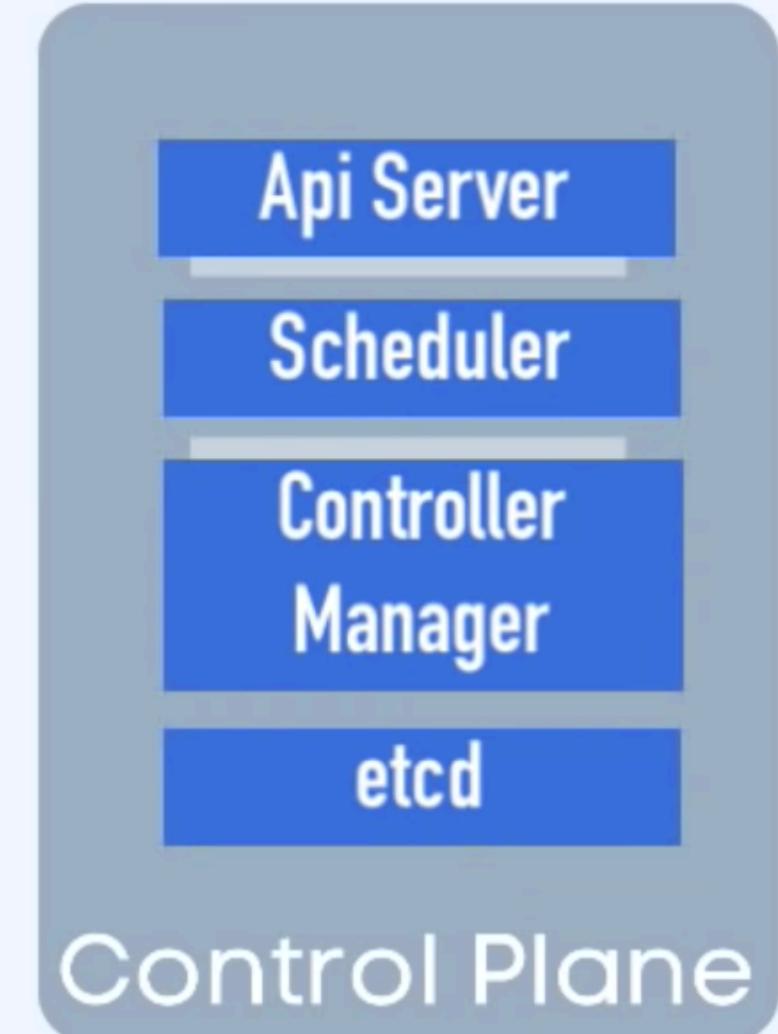
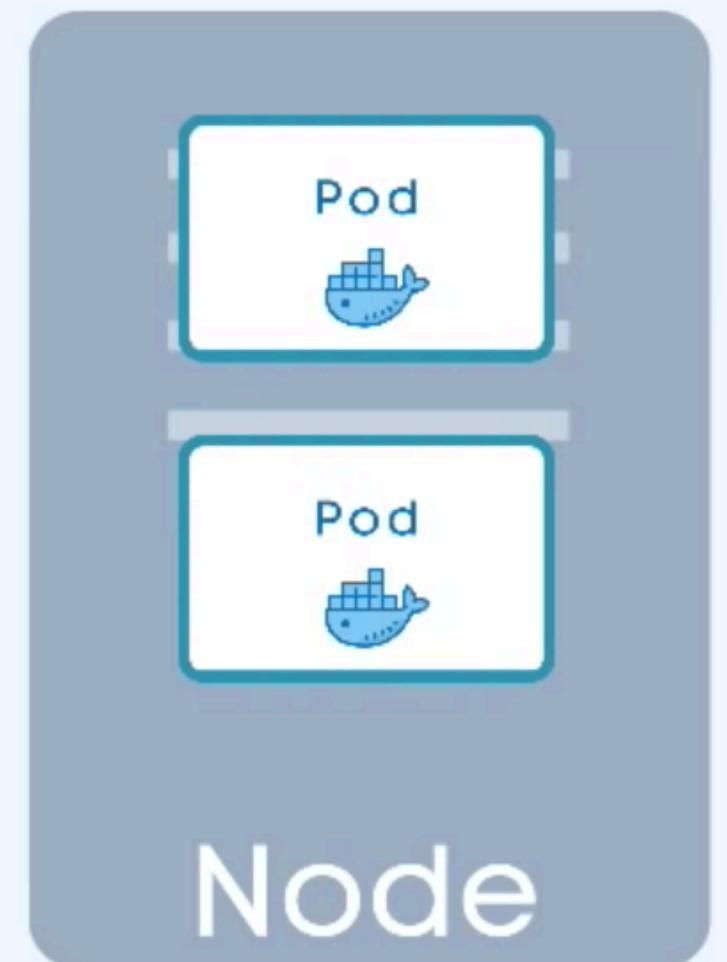
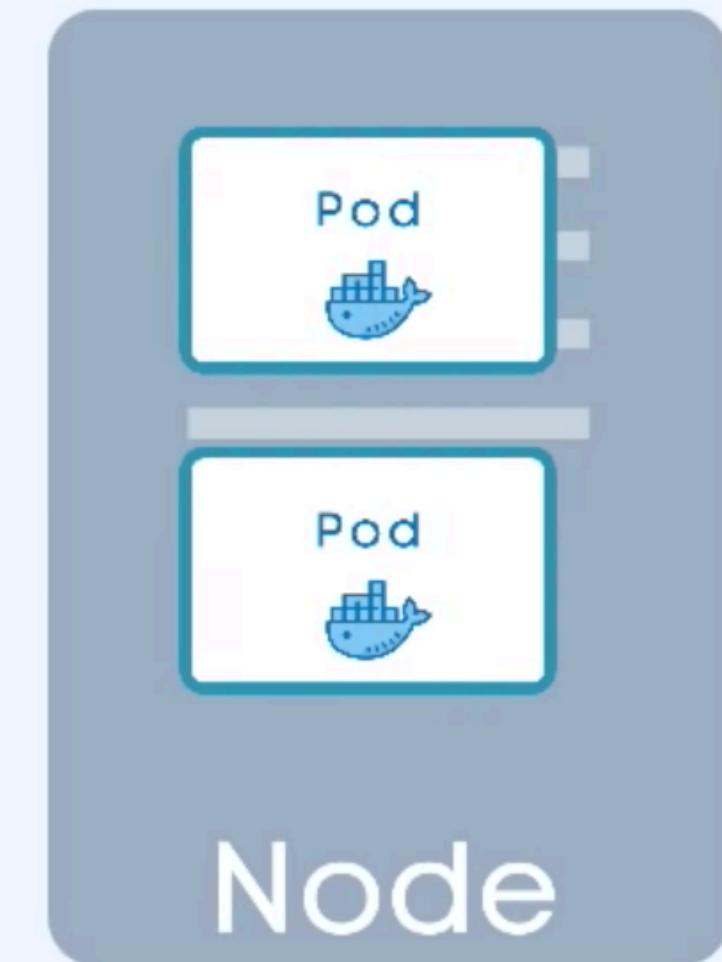
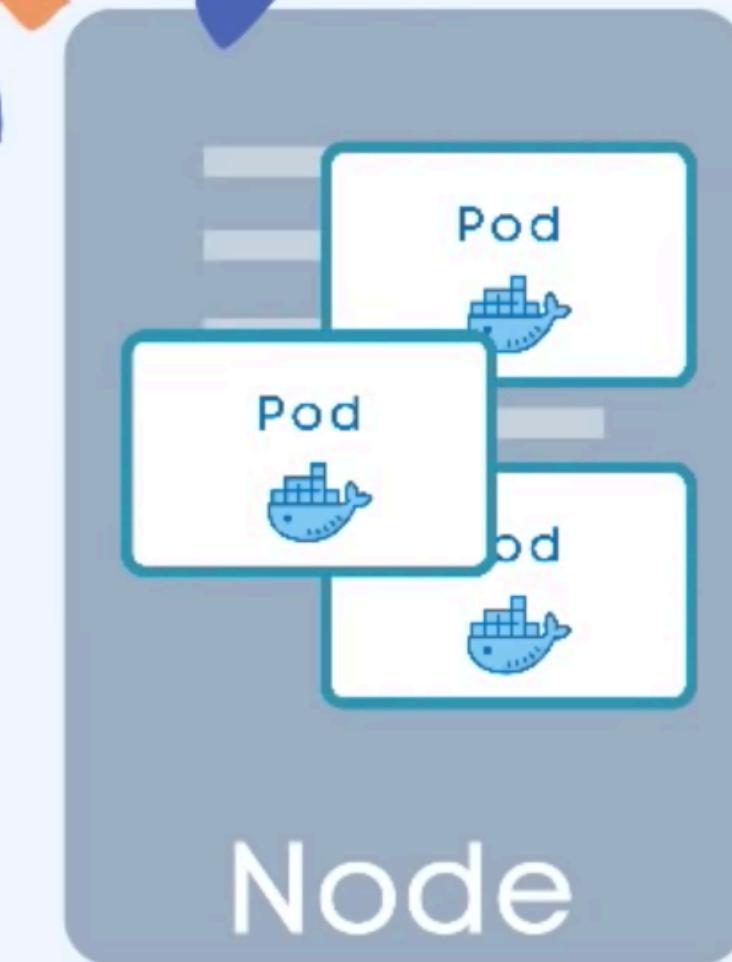
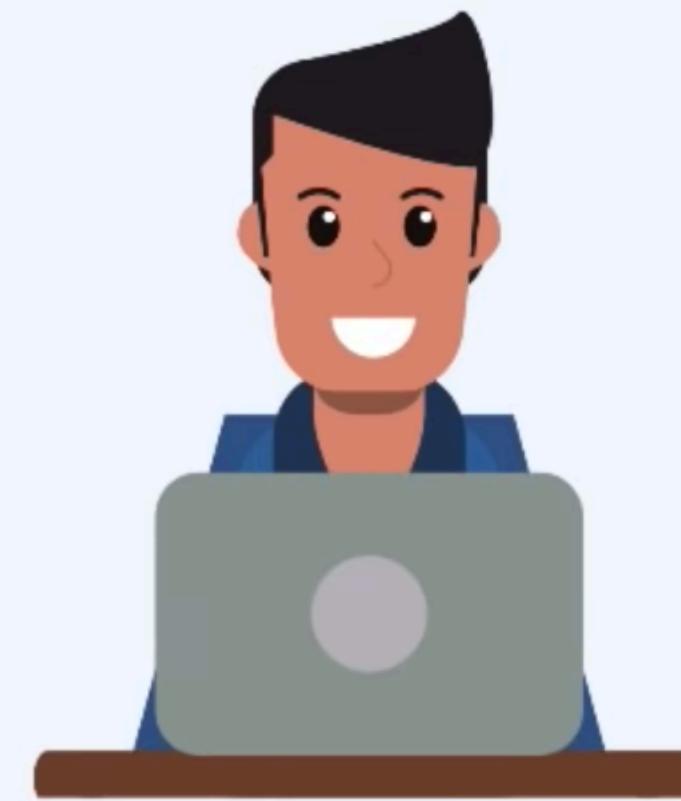
Deployment =  
a template for  
creating pods

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: my-app
  labels:
    app: my-app
spec:
  replicas: 2
  selector:
    matchLabels:
      app: my-app
  template:
    metadata:
      labels:
        app: my-app
    spec:
      containers:
        - name: my-app
          image: my-image
          env:
            - name: SOME_ENV
              value: $SOME_ENV
          ports:
            - containerPort: 8080
```



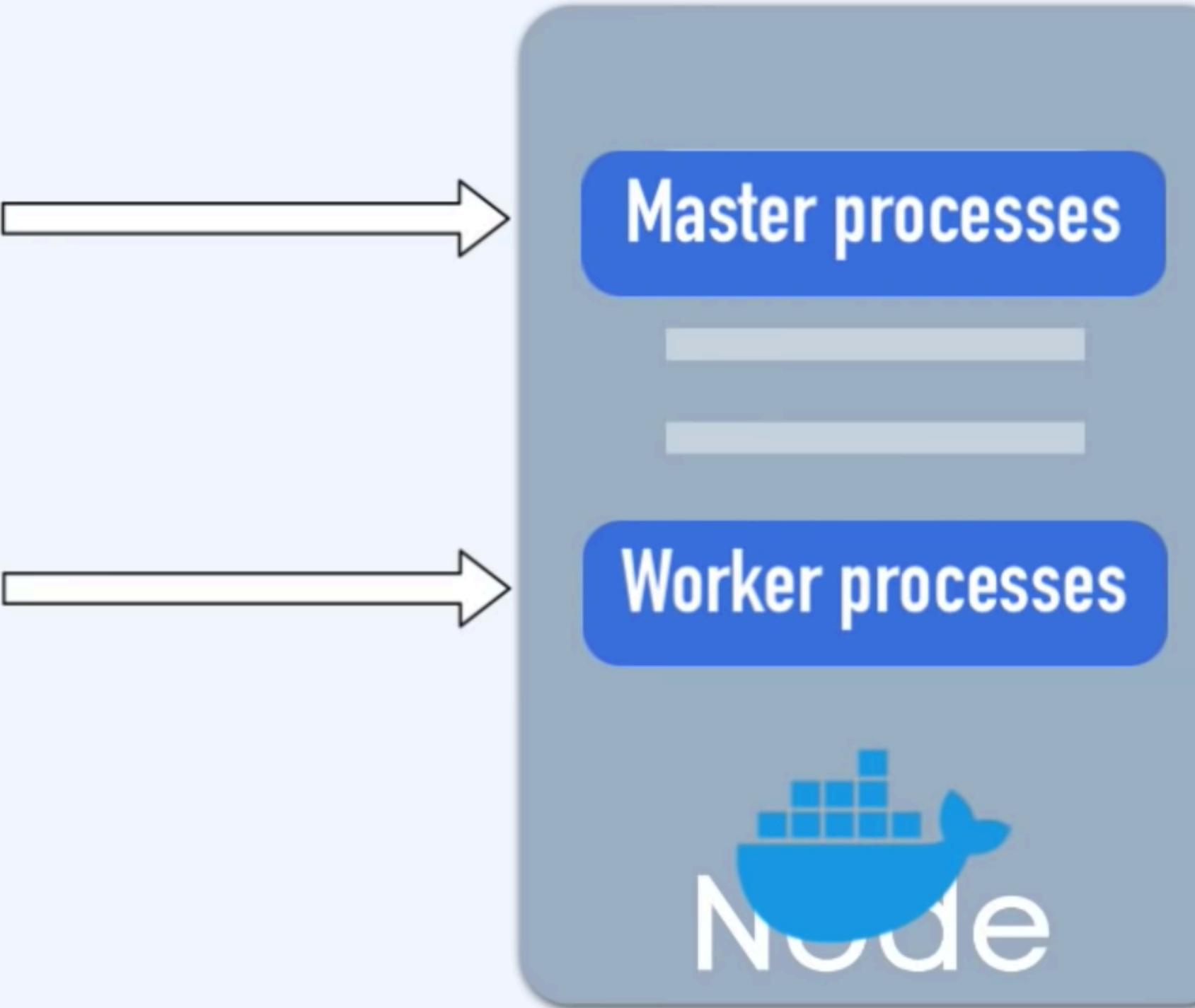
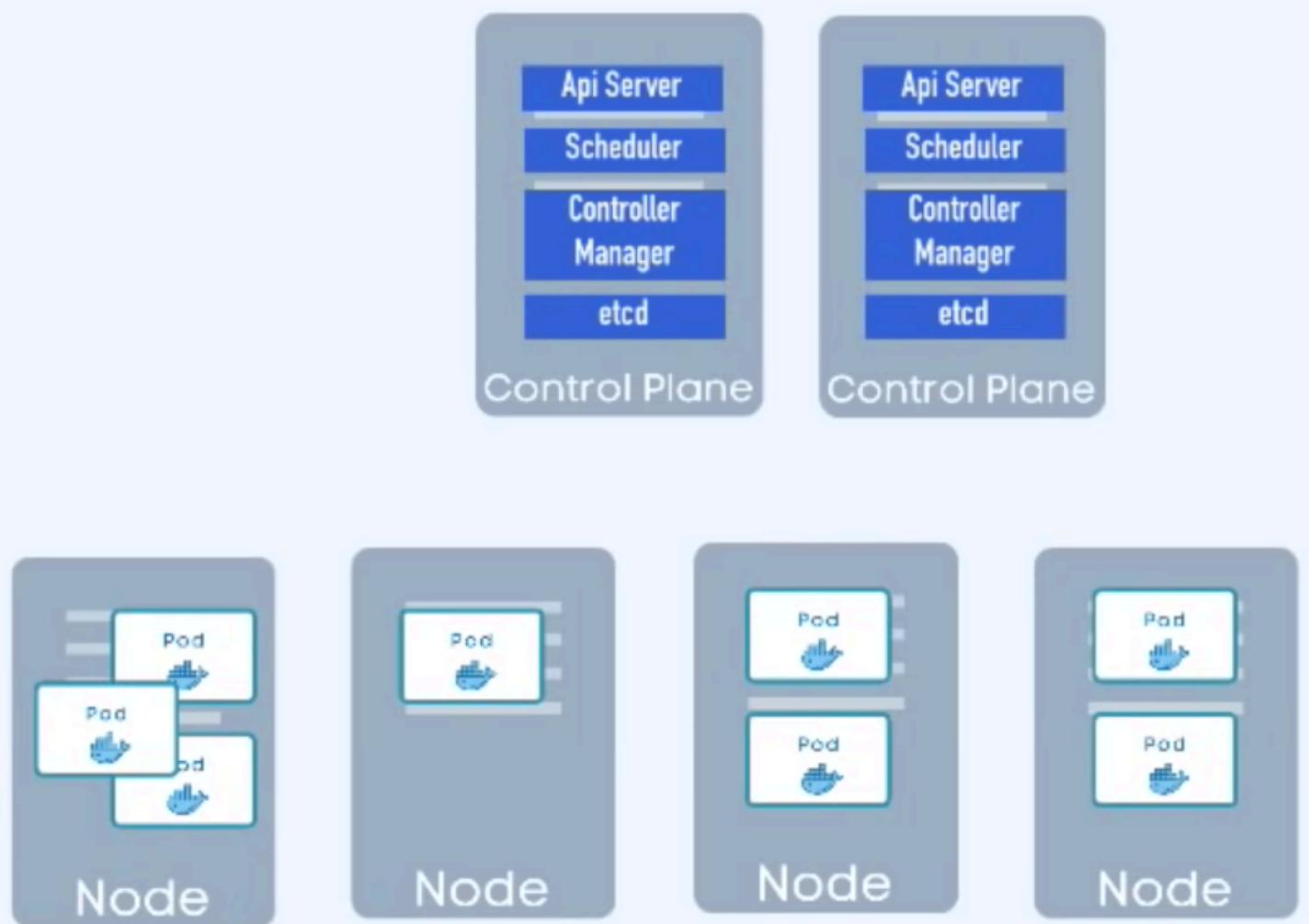
# Production Cluster Setup

Test on local machine?





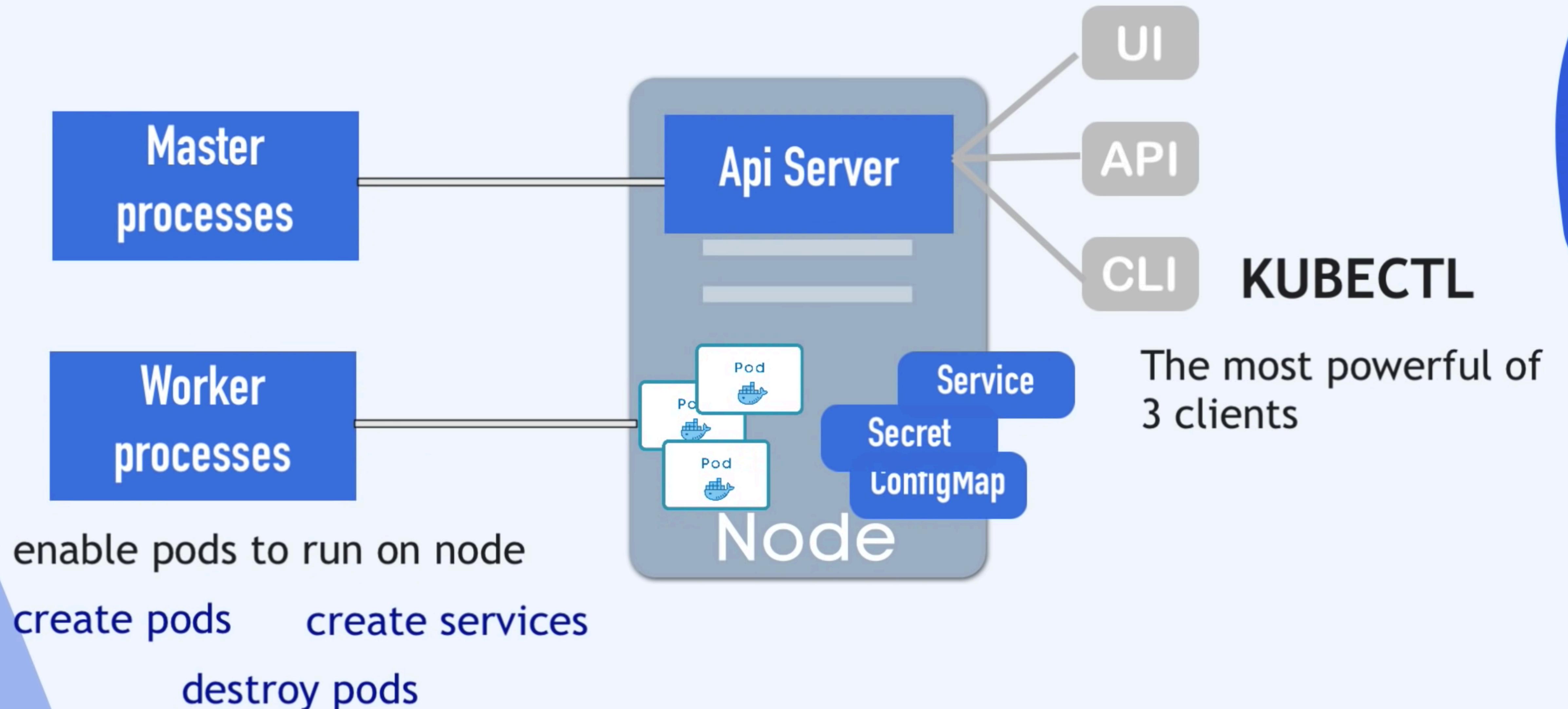
# Test/Local Cluster Setup

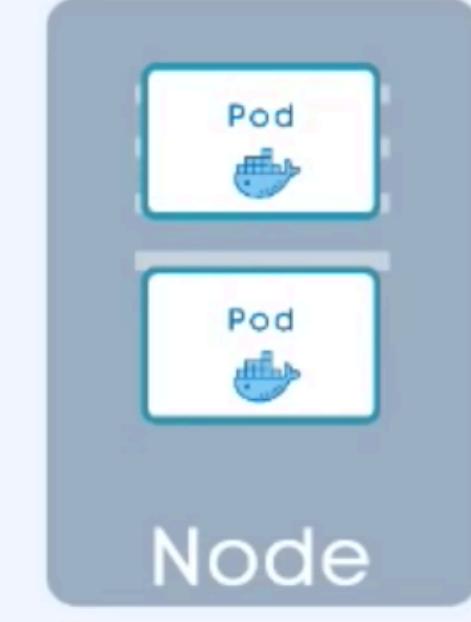
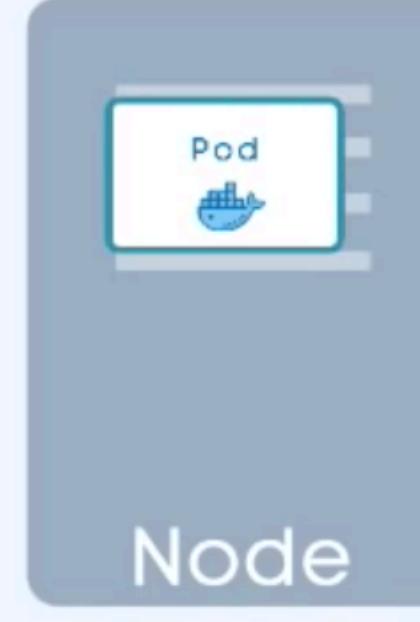
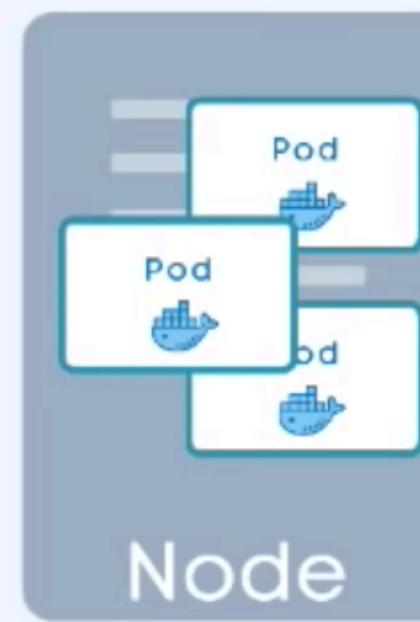
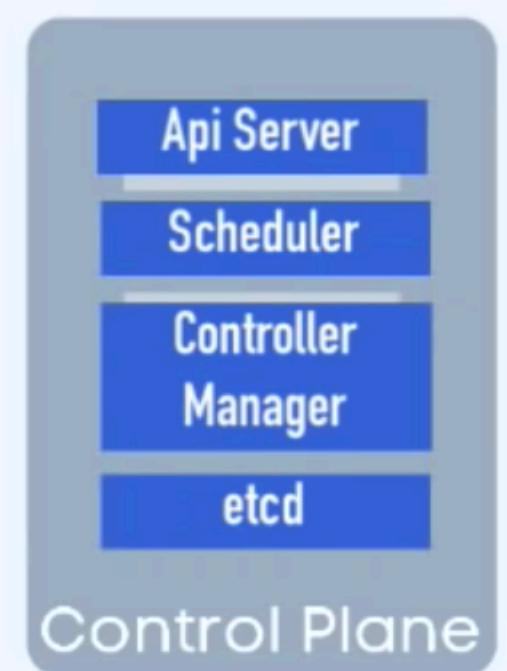
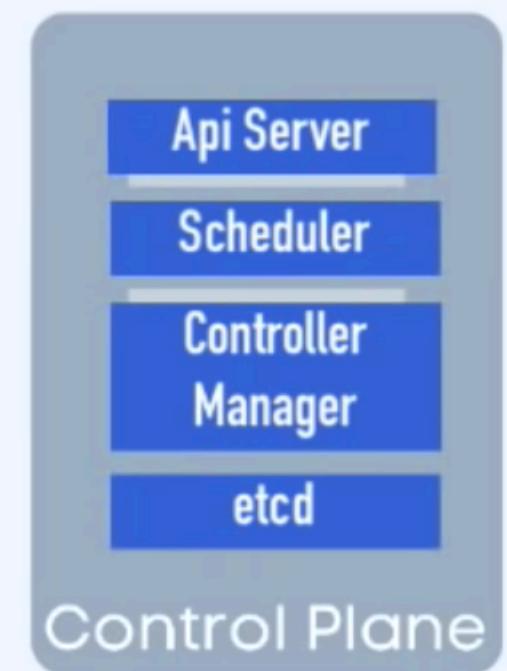
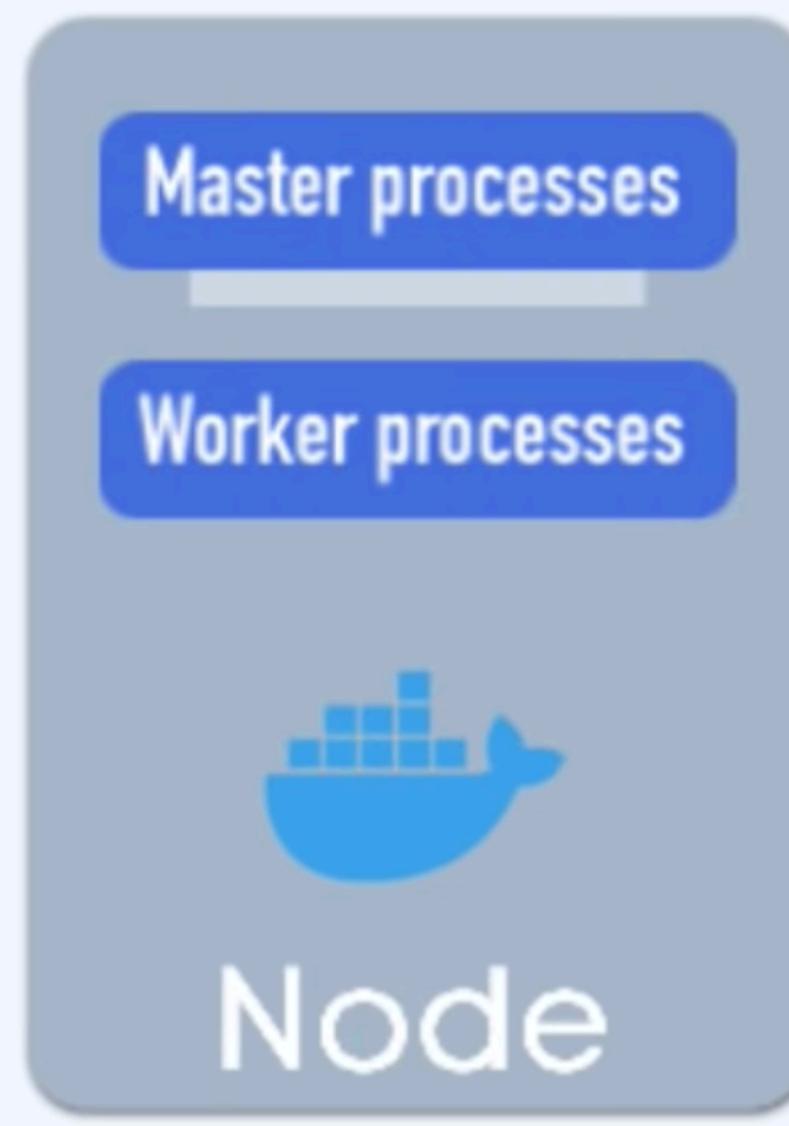


Docker pre-installed

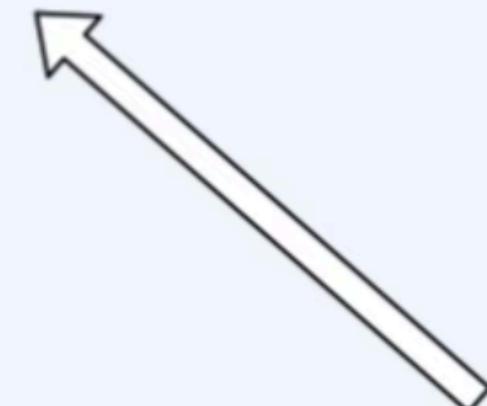


# What is kubectl?

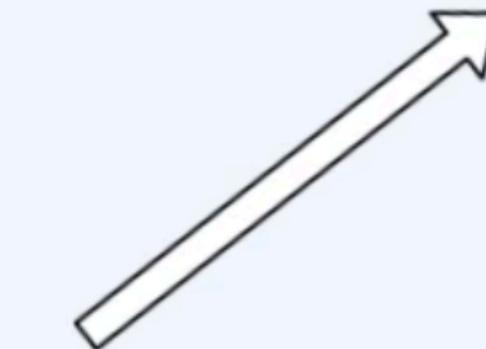




**Minikube cluster**



**Cloud cluster**





**THANK YOU**

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