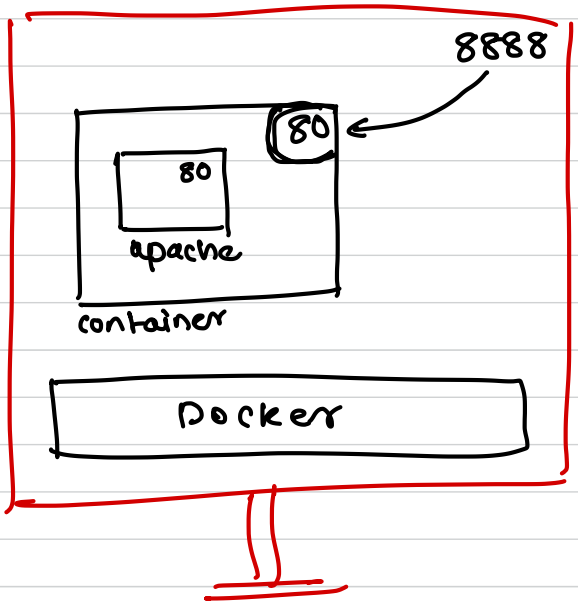
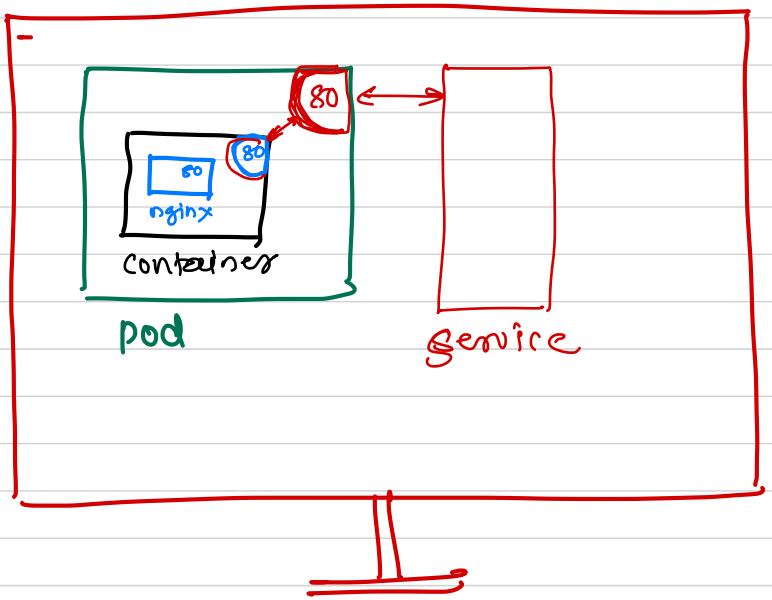
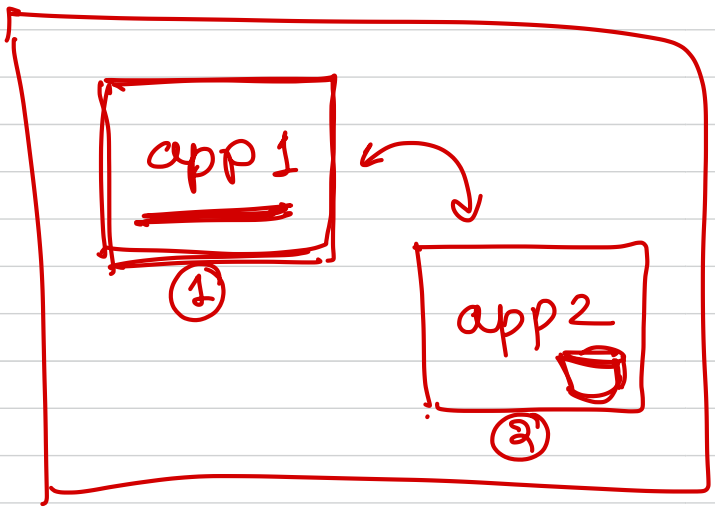
kubernetes

Multi-Container Pods (10%)


8888
80
80
apache
container
Docker


80
80
80
nginx
container
pod
service

multi-containers



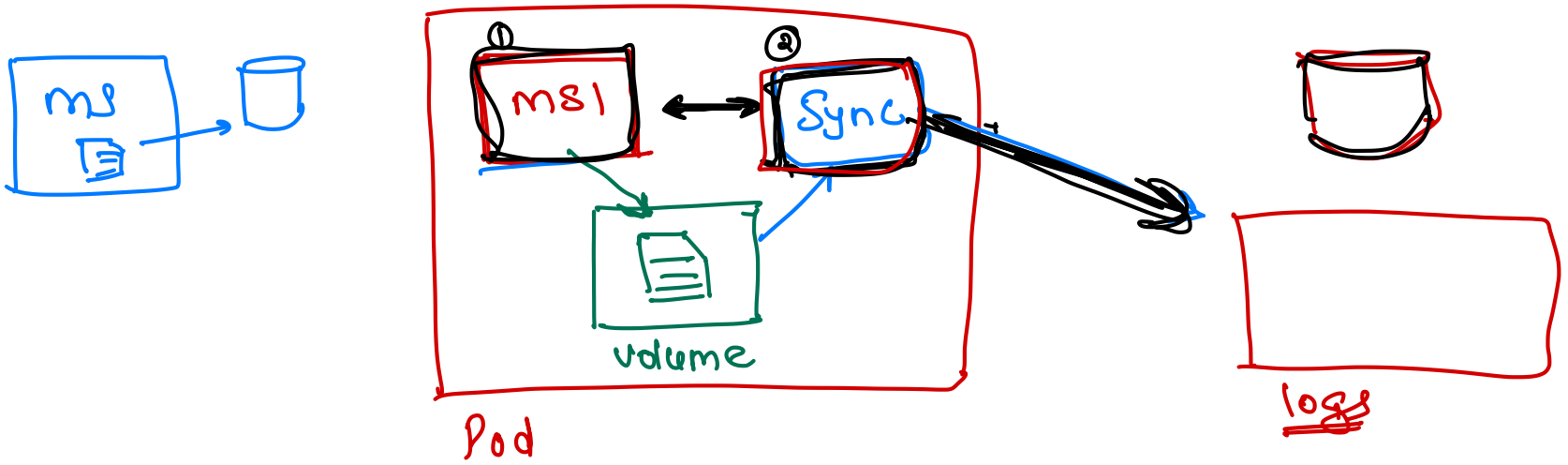
Pod

Sidecar

Init Containers

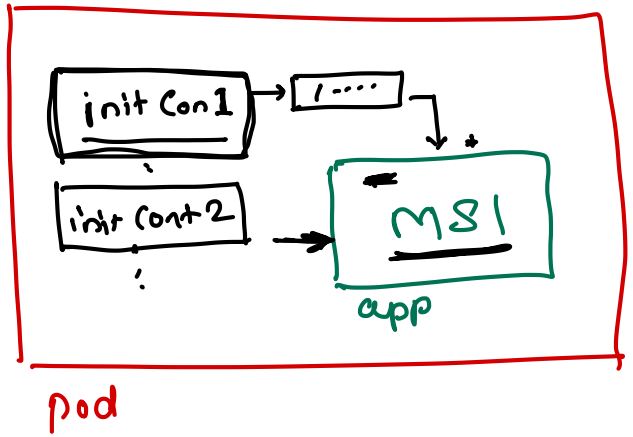
Sidecar

- Design pattern where a pod may run multiple containers
- These containers share resources like the IP address assigned to the pod and a volume
- Tasks
  - Create a pod with two containers
  - Create a volume and mount it in both the containers
  - Write data to the volume from one container and format the result in another container



Init Containers

- These are the specialized containers that run before the application containers in a Pod
- A pod can have one or more init containers
- Init containers are similar to regular containers except
  - The init containers always run before the application container
  - The init containers always run to completion
  - Each init container must complete successfully before the next one starts
  - If a pod's init container fails, kubernets repeatedly restarts the pod until the init container succeeds
- Tasks
  - Create a pod with init container



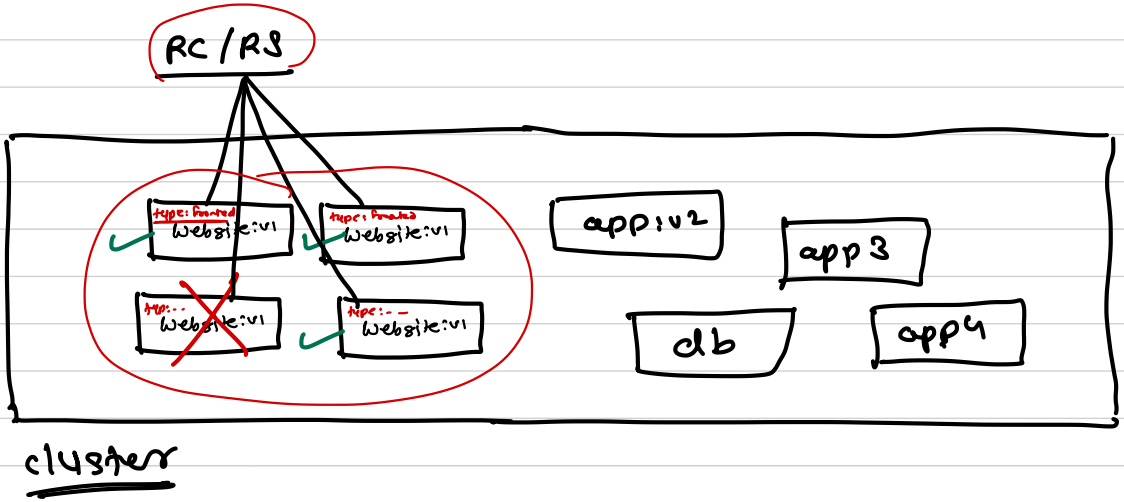
Pod Design (20%)

① Coding

② Deployment

- containerize
  - ✓ → create docker image
  - ✓ → push image to ducker hub

- kubernetes
  - ✓ → run app inside kube cluster



Replication Controller & ReplicaSet

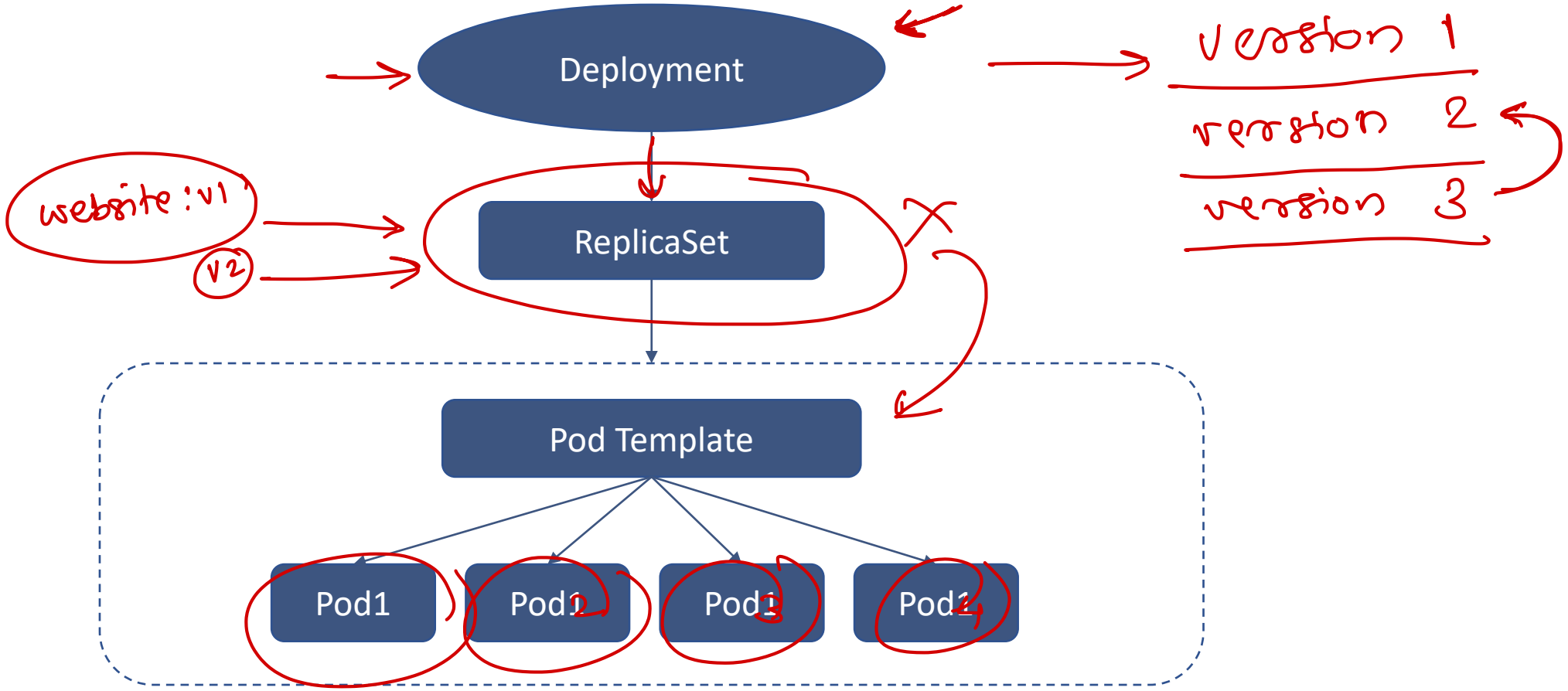
- Both of them do the similar job
- You specify the number of pods (desired count) you want to run, and RC or RS will make sure that those many pods are running at any given time
- If pod crashes RC/RS will start new pods to match the desired count
- To create the new pod, RC/RS will use the template specified in the yml definition
- Replication Controller supports only equality based selectors
- ReplicaSet supports both equality based as well as set based selectors

- Tasks
  - Create a equality based selector replication controller
  - Create a equality based selector replica set
  - Create a set based selector replica set

Deployments

- Describes the desired state of a component of the application
- In a simplest case, deployment involves one more more ReplicaSets to create pod replicas
- User does not require to use ReplicaSet separately as deployment will use it internally
- A single deployment is similar to a single microservice in the application
- Result of each deployment is a ReplicaSet which then manage the pods in the microservice
- You can create deployment
  - Using command - imperative
  - Using yml definition file
- Tasks:
  - Create deployment using command line
  - Create deployment using yml definition file

Deployment


Deployment
ReplicaSet
Pod Template
Pod1
Pod1
Pod1
Pod1
website :v1
v2
version 1
version 2
version 3

Deployment functionalities

- Updating
- Rolling Back
- Scaling
- Pausing and Resuming

Configuration (18%)

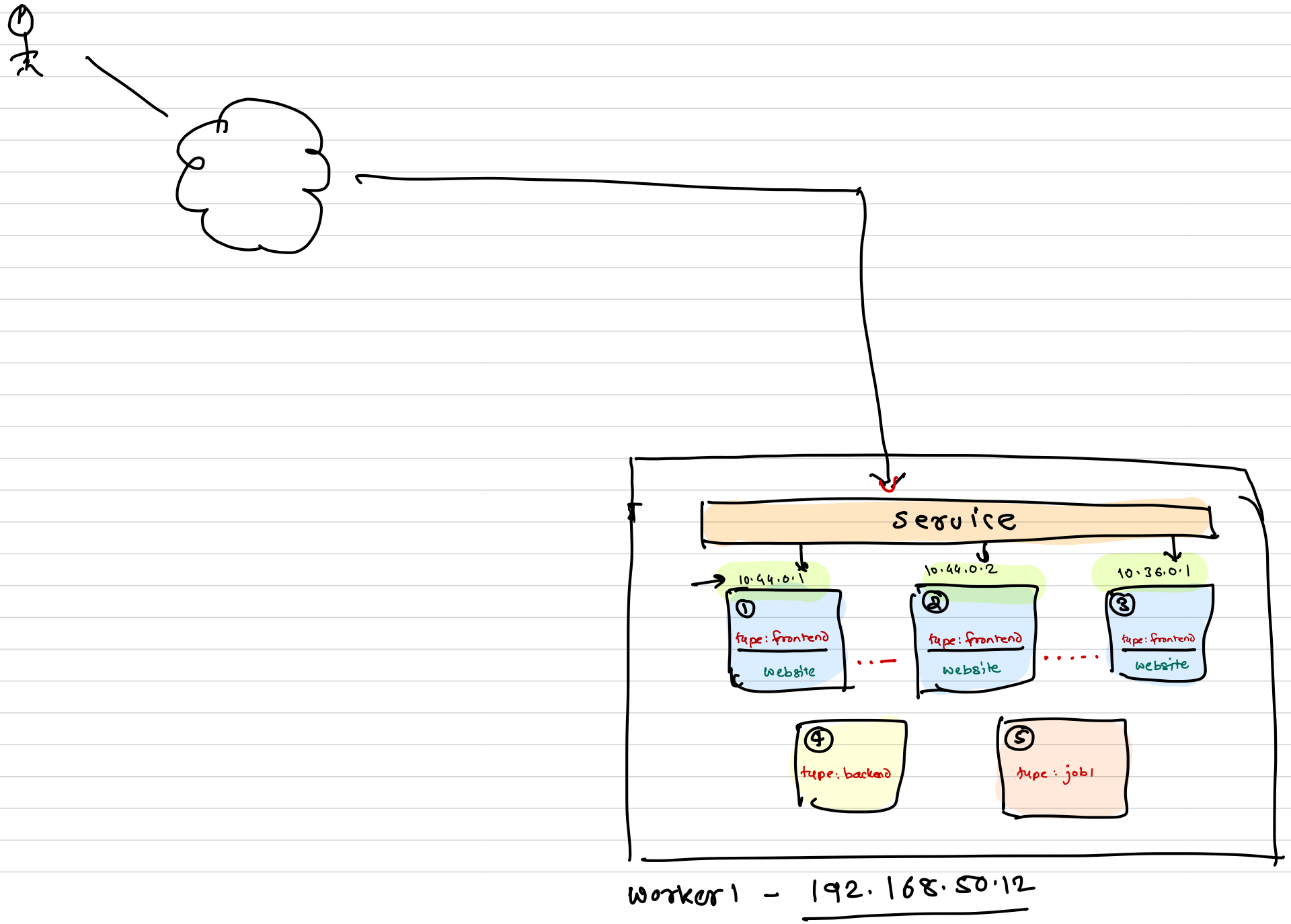
Secrets

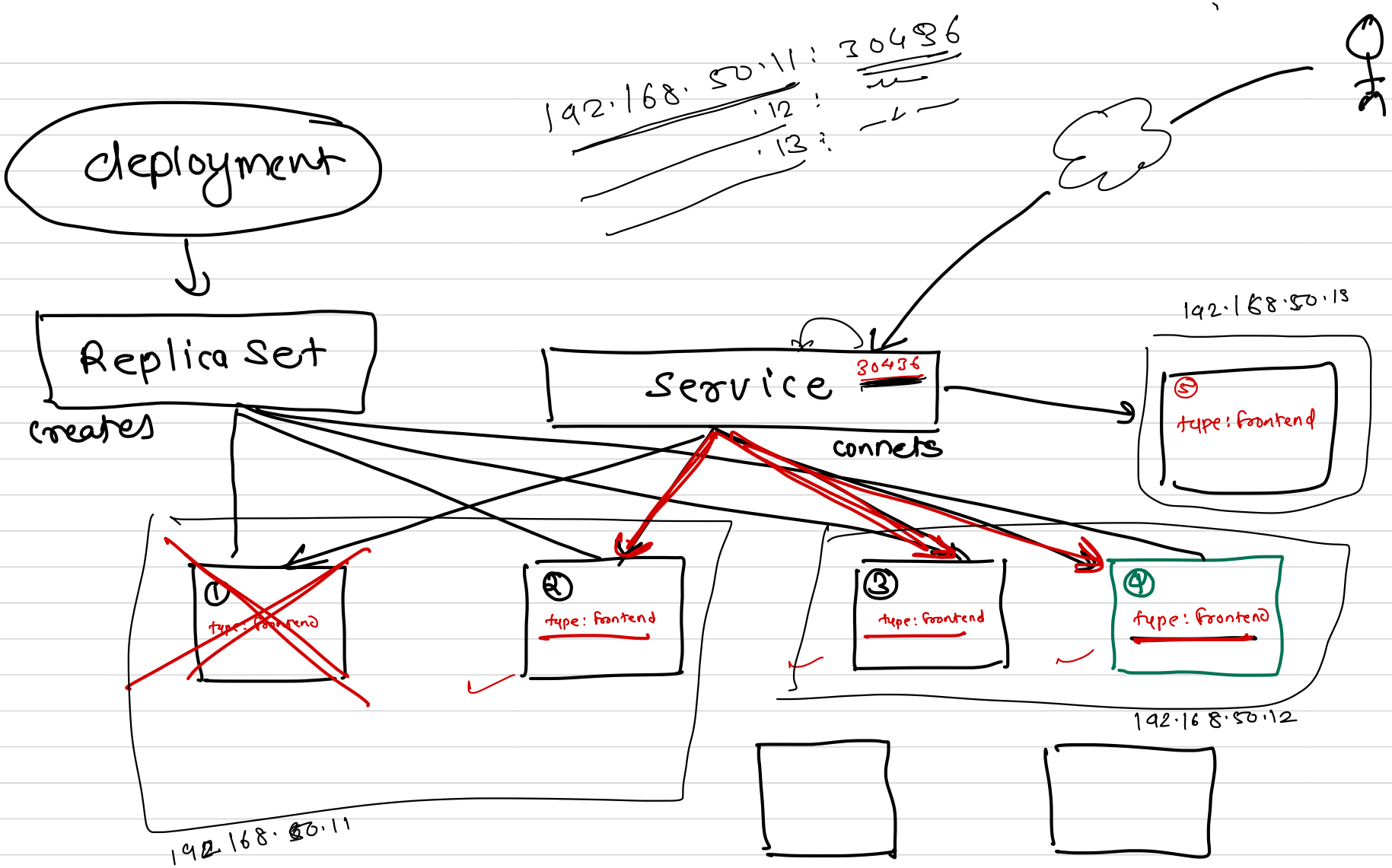
- Usually used to pass initial data for application
- Contains a small amount of sensitive data such as a password or a token
- Represented by a Kubernetes object
- Sensitive data in a Secret object allows for more control and reduces the risk of accidental exposure
- Can be created administrators or developers
- Needs to be created before the pod that depends on it
- Individual secrets are limited to 1MB in size
- Tasks
  - Create secret with key-value pairs
  - Create a pod which consumes the secret

ConfigMaps

- Used to store non-confidential data in key-value pairs
- Pod can consume the ConfigMaps as environment variables, command line arguments or as configuration files in a volume
- Tasks
  - Create a config map with key-value pairs
  - Create a pod that consumes the config map

Services & Networking (13%)


Service
10.44.0.1
10.44.0.2
10.36.0.1
type: frontend
website
type: frontend
website
type: frontend
website
type: backend
type: job
Worker1 - 192.168.50.12

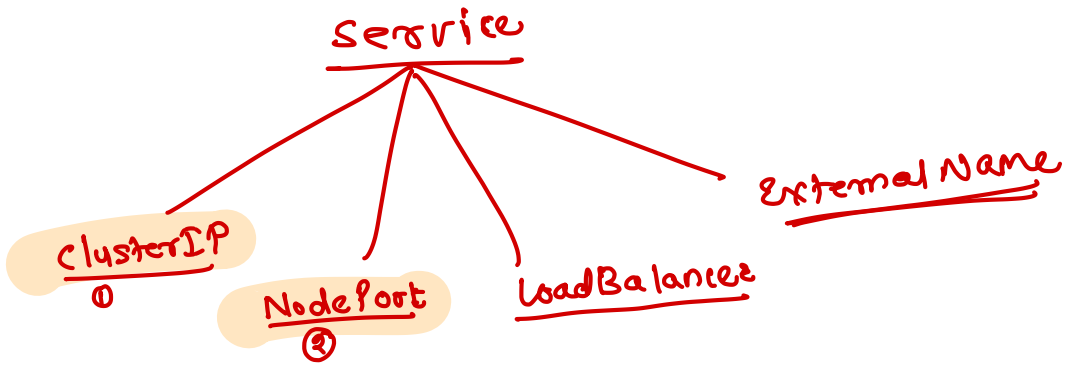

deployment
Replica Set
creates
192.168.50.11 : 30436
.12 :
.13 :
Service
30436
connects
192.168.50.13
type: frontend
type: frontend
type: frontend
type: frontend
type: frontend
192.168.50.12
192.168.50.11

Need of Services

- Kubernetes pods are mortal, means they can die because of any reason
- Kubernetes provide different controllers to manage the lifecycle of these pods.
- Kubernetes gives a pod its own unique IP address, but if the pod dies then the IP address changes
- It becomes very difficult to keep track of which IP address to connect to access the application
- The problem increases in multi-tier applications

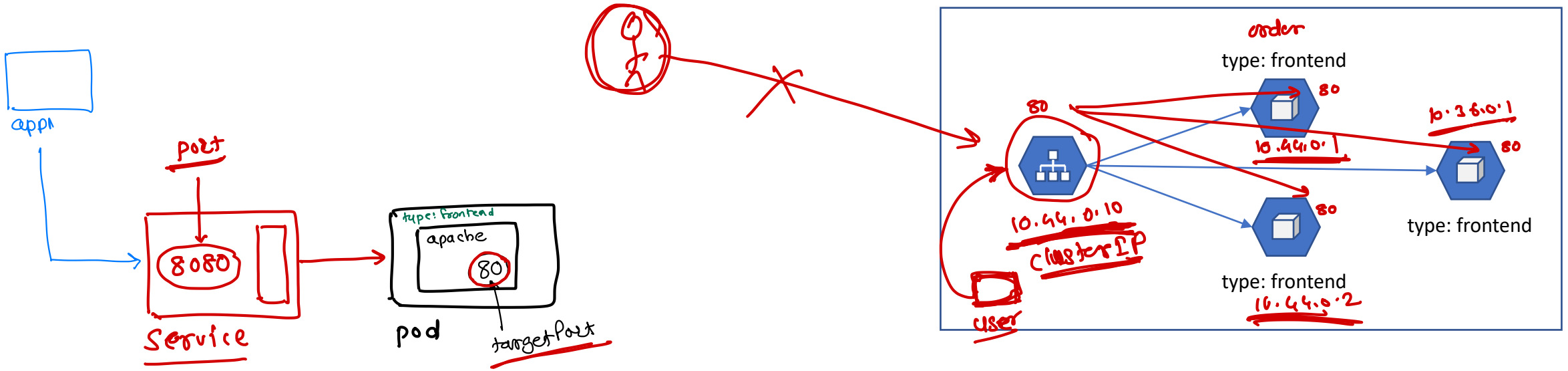
Service

- Service provides an abstraction for a set of Pods and a policy to access them
- The set of Pods targeted by a service are determined by selector
- Service is used to expose an application running in set of pods
- It provides a single DNS name and can load balance across them
- Represented by Kubernetes API object and it is namespaced



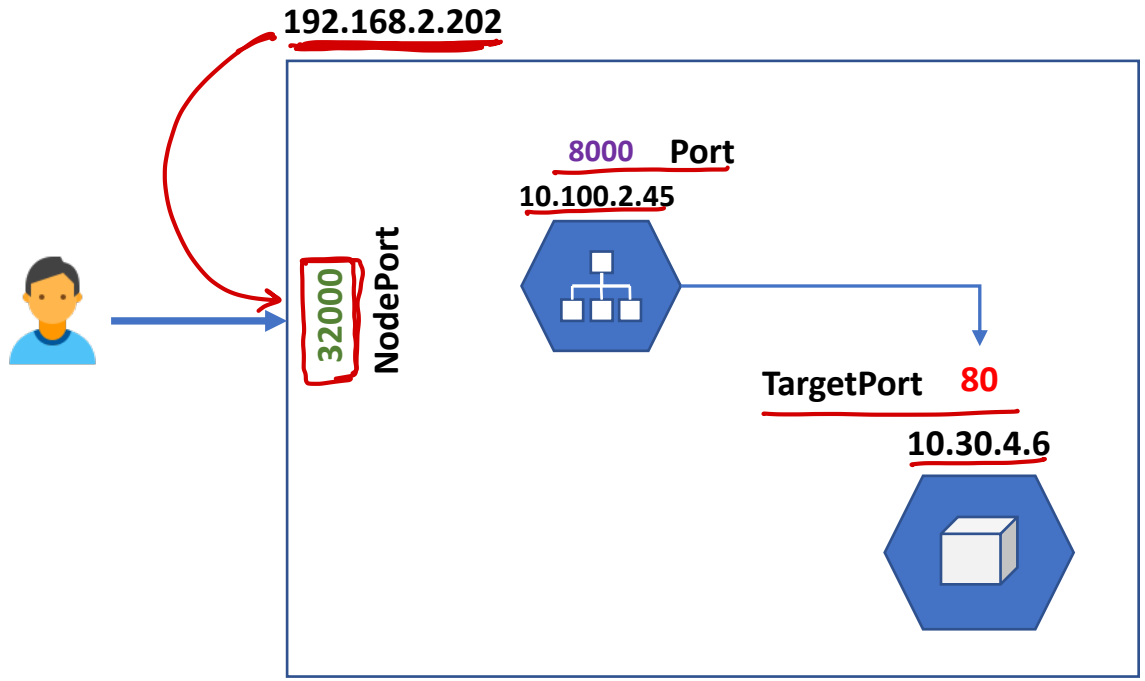
Service Type: ClusterIP

- Exposes the service within the cluster
- It uses cluster internal IP which is not reachable from external network
- Service maps any incoming port to a targetPort



Service Type: NodePort

- Exposed on each node's IP address
- NodePort service can be accessible from external network
- Service provides the NodePort on which the application is accessible
- ClusterIP service gets created automatically



Service Types

- LoadBalancer
  - Exposes the service externally using a cloud provider's load balancer
  - Along with the LoadBalancer, ClusterIP and NodePort services are created automatically
  - External load balancer routes the traffic through these pods
- ExternalName
  - The service does not contain the selectors, instead it uses DNS names
  - It maps the pod to the external name like test.sunbeaminfo.com
  - Mainly used to expose and object using cname record