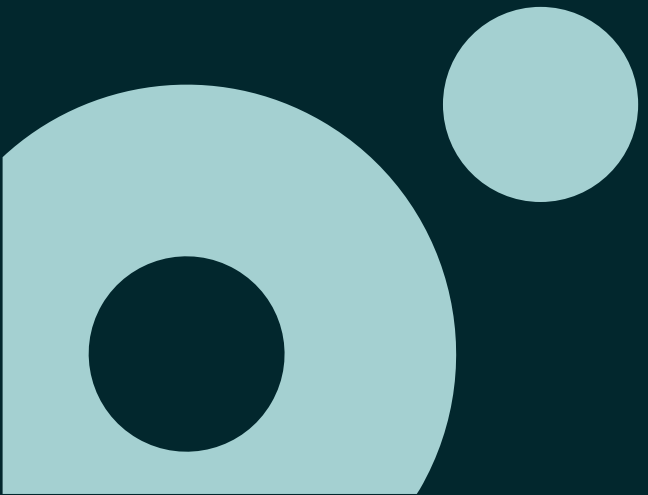
Containers & Kubernetes

Session #07



Services

ClusterIP

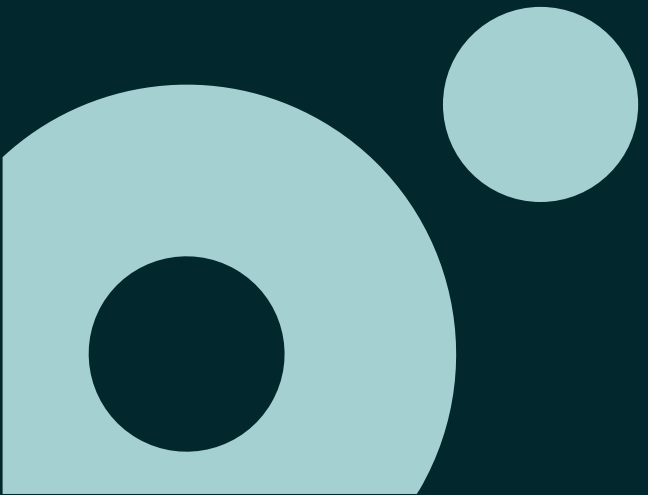
NodePort

LoadBalancer

Ingress & IngressController

Lab

Services



Motivation

Services

- Kubernetes Pods are created and destroyed to match the state of your cluster making them ephemeral
- Each Pod gets its own IP address, however in a Deployment, the set of Pods running in one moment in time could be different from the set of Pods running that application a moment later
- If some set of Pods provides functionality to other Pods inside your cluster, how do they find out and keep track of which IP address to connect to?

What is a Service?

Services

- An abstraction that defines a logical set of loosely-coupled pods and a policy by which to access them as a network service.
  - Use **selectors** to define which pods to include.
  - Load balances traffic to Pods (Layer 4)
  - Exposes Pods to other Pods within the cluster
  - Maps external ports to target (container) ports
- Kubernetes **automatically updates** which Pods are available to which service by creating Endpoints objects.
- 3 types
  - ClusterIP
  - NodePort
  - LoadBalancer

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Service Manifest

Service

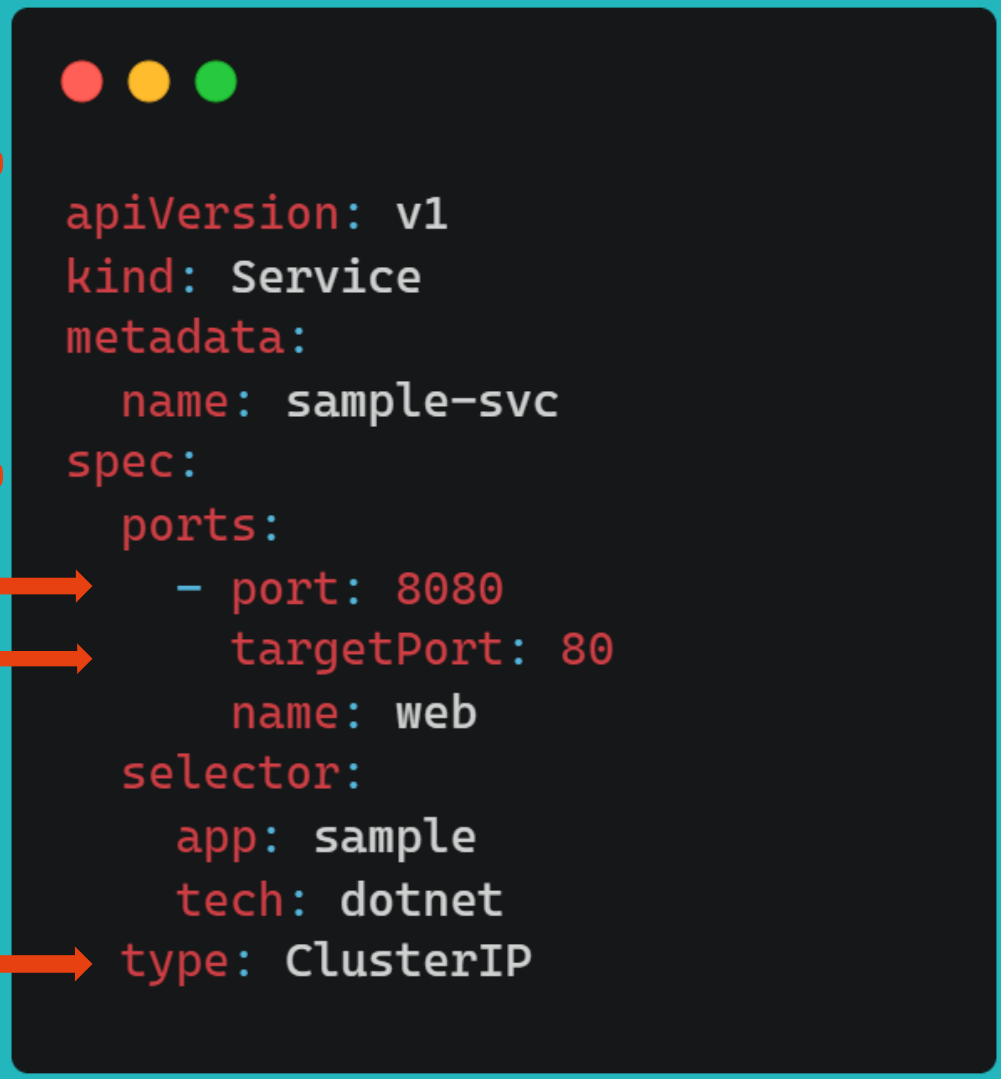
Service properties

port sets service port

targetPort refers pods port

selector defines pods selector

type defines service type



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Endpoint Object

Service

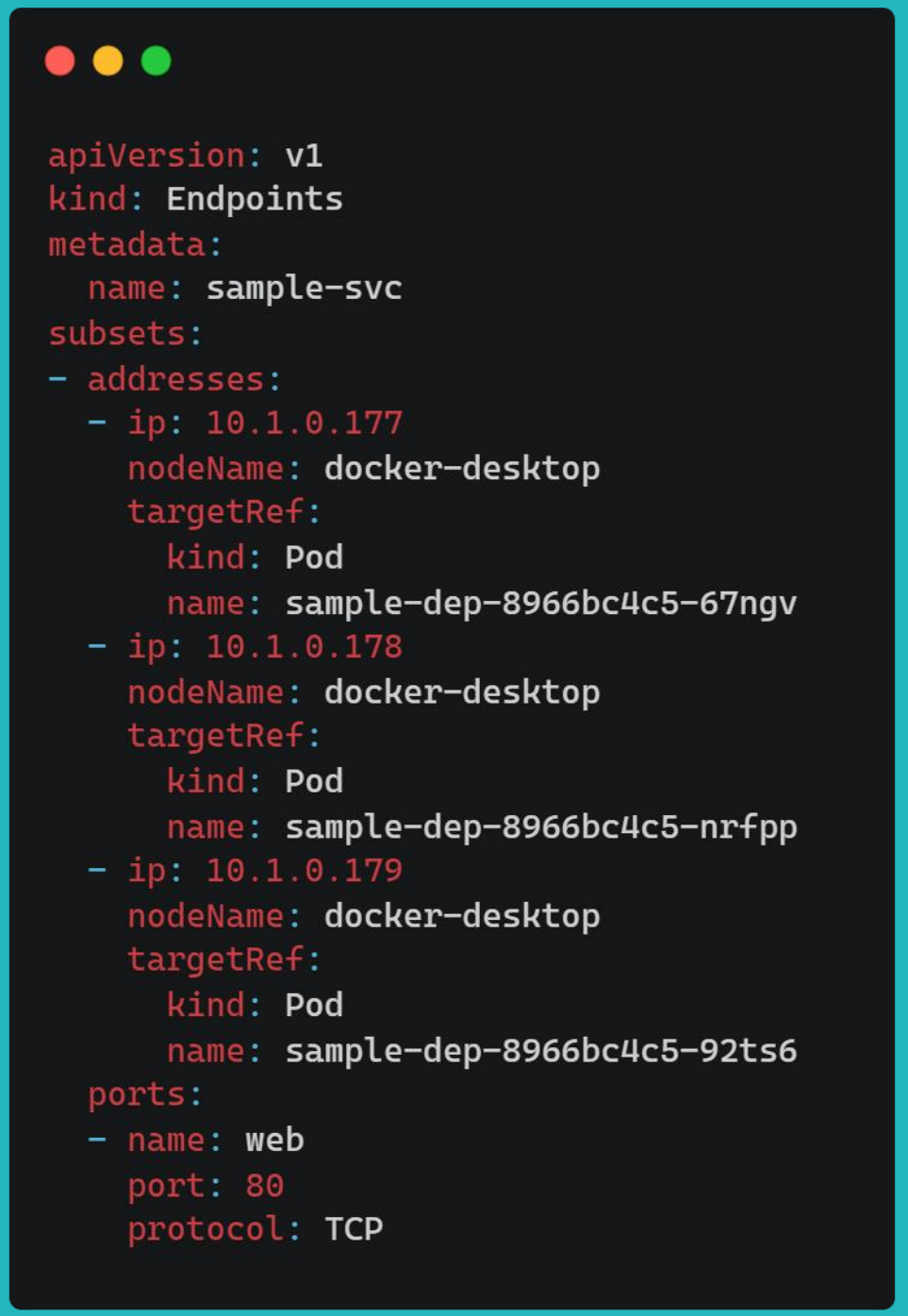
Endpoint properties

Each block defines pod settings

Each block defines pod settings

Each block defines pod settings

ports defines how to connect to pods



```yaml
apiVersion: v1
kind: Endpoints
metadata:
  name: sample-svc
subsets:
- addresses:
  - ip: 10.1.0.177
    nodeName: docker-desktop
    targetRef:
      kind: Pod
      name: sample-dep-8966bc4c5-67ngv
  - ip: 10.1.0.178
    nodeName: docker-desktop
    targetRef:
      kind: Pod
      name: sample-dep-8966bc4c5-nrfpp
  - ip: 10.1.0.179
    nodeName: docker-desktop
    targetRef:
      kind: Pod
      name: sample-dep-8966bc4c5-92ts6
  ports:
  - name: web
    port: 80
    protocol: TCP
```

Load Balancing

Services

- Depends on kube-proxy configuration mode
- User space proxy mode
  - Uses round-robin algorithm to select pods
- Iptables proxy mode (default)
  - Uses random selection of pods
- IPVS proxy mode
  - rr: round-robin
  - lc: least connection (smallest number of open connections)
  - dh: destination hashing
  - sh: source hashing
  - sed: shortest expected delay
  - nq: never queue

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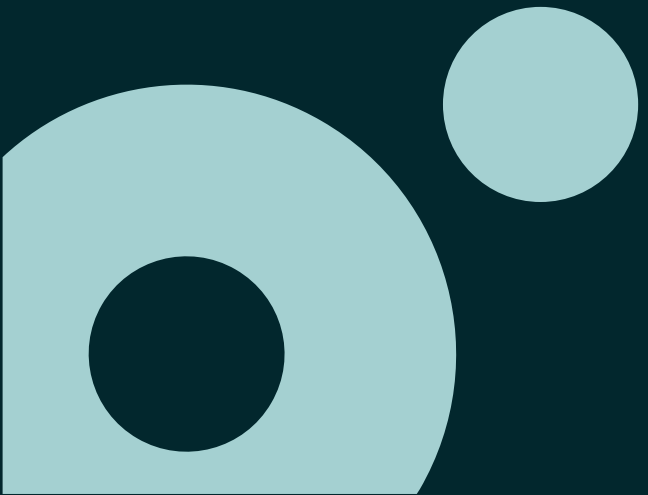
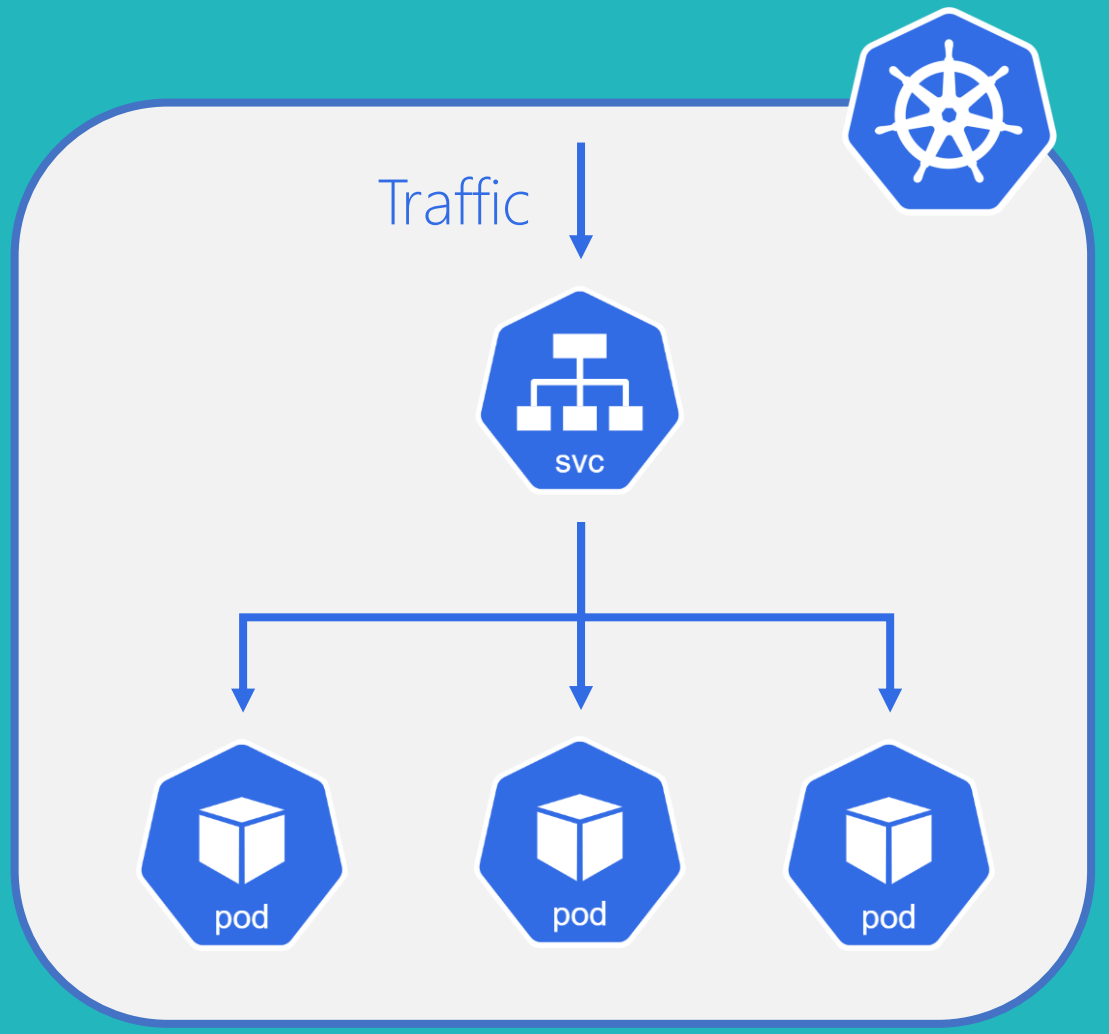
ClusterIP



ClusterIP

Services

- Exposes the Service on a cluster-internal IP
- Choosing this value makes the Service only reachable from within the cluster
- Default service type
- Uses service name as a DNS
  - http://svc-name
  - http://svc-name.ns.svc.cluster.local



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Deployment

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: sample-dep
spec:
  replicas: 3
  selector:
    matchLabels:
      app: sample
      tech: dotnet
  template:
    metadata:
      labels:
        app: sample
        tech: dotnet
    spec:
      containers:
      - name: sample
        image: mcr.microsoft.com/dotnet/samples:aspnetapp
        ports:
        - containerPort: 80
```

ClusterIP

```yaml
apiVersion: v1
kind: Service
metadata:
  name: sample-svc
spec:
  ports:
    - port: 8080
      targetPort: 80
      name: web
  selector:
    app: sample
    tech: dotnet
  type: ClusterIP
```


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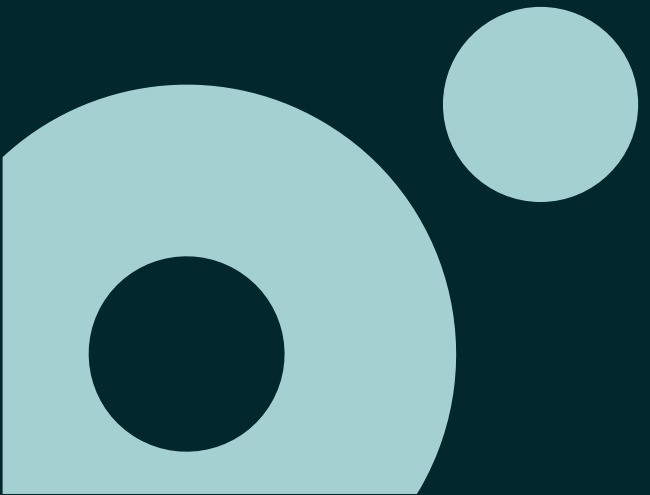
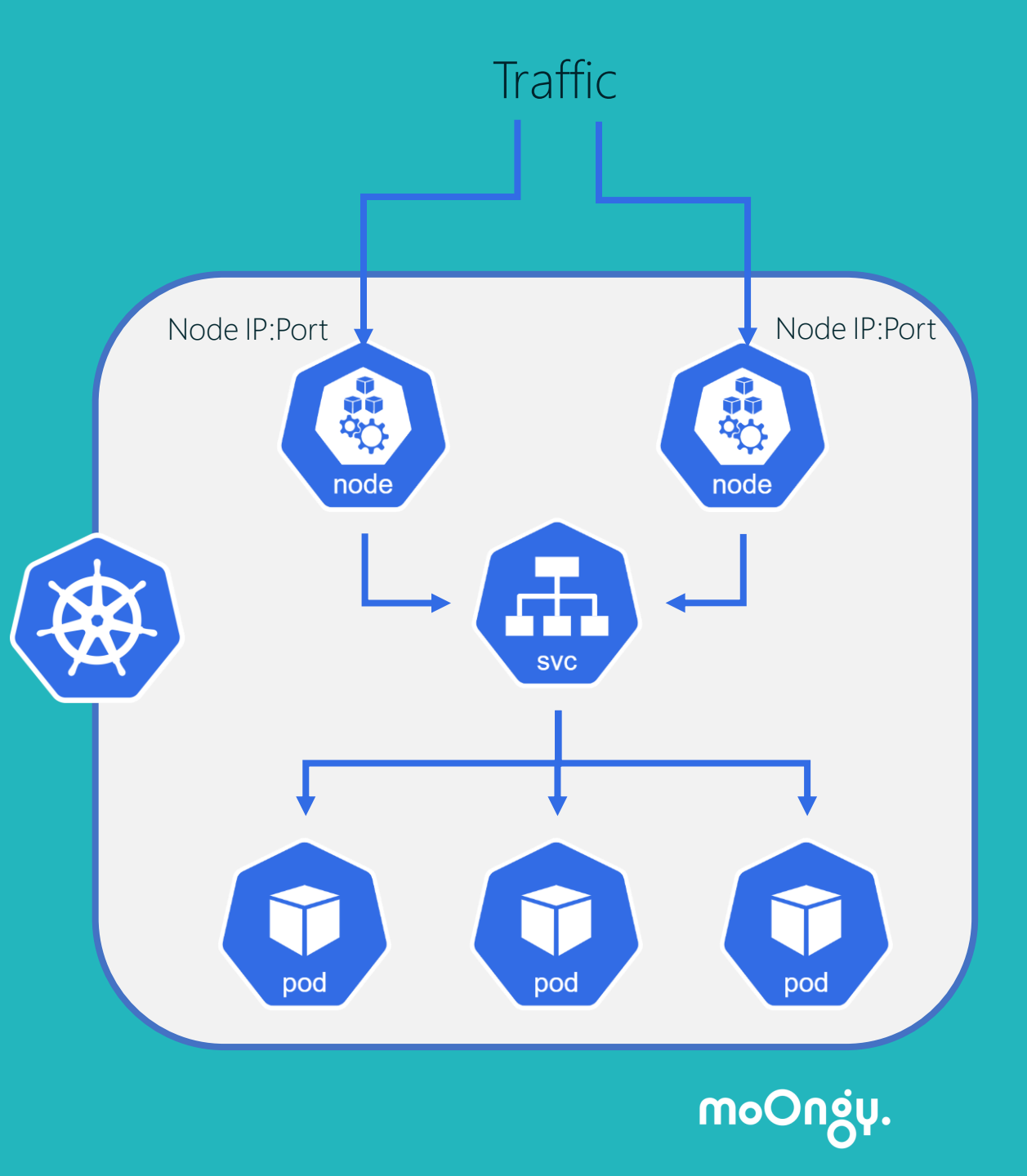
Node Port



NodePort

Services

- Exposes the Service on each Node's IP at a static port (the NodePort)
- A ClusterIP Service, to which the NodePort Service routes, is automatically created.
- You'll be able to contact the NodePort Service, from outside the cluster, by requesting **`<NodeIP>:<NodePort>`**
- If **`nodePort`** property is not specified, is automatically set an port from the range 30000-32767



NodePort

```yaml
apiVersion: v1
kind: Service
metadata:
  name: sample-svc
spec:
  ports:
    - port: 8080
      targetPort: 80
      nodePort: 30000
      name: web
  selector:
    app: sample
    tech: dotnet
  type: NodePort
```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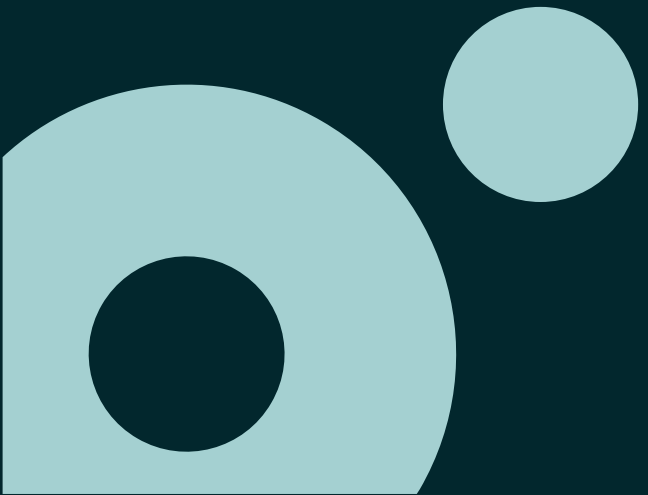
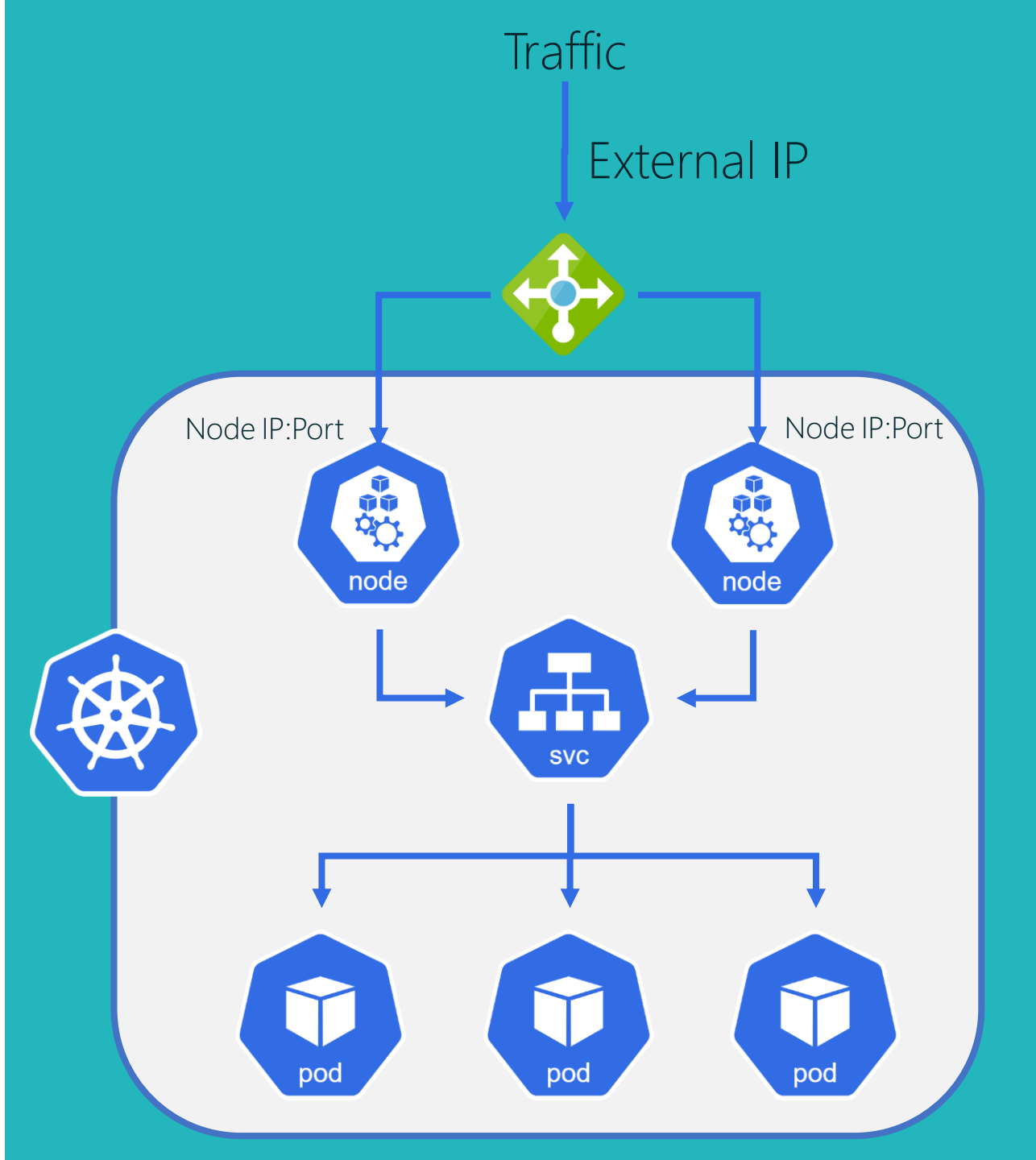
Load Balancer



LoadBalancer

Services

- Exposes the Service externally using a cloud provider's load balancer
- NodePort and ClusterIP Services, to which the external load balancer routes, are automatically created
- On-prem needs manual configuration
- Can be internal (no public IP)



LoadBalancer

```yaml
apiVersion: v1
kind: Service
metadata:
  name: sample-svc
spec:
  ports:
    - port: 8080
      targetPort: 80
      nodePort: 30000
      name: web
  selector:
    app: sample
    tech: dotnet
  type: LoadBalancer
```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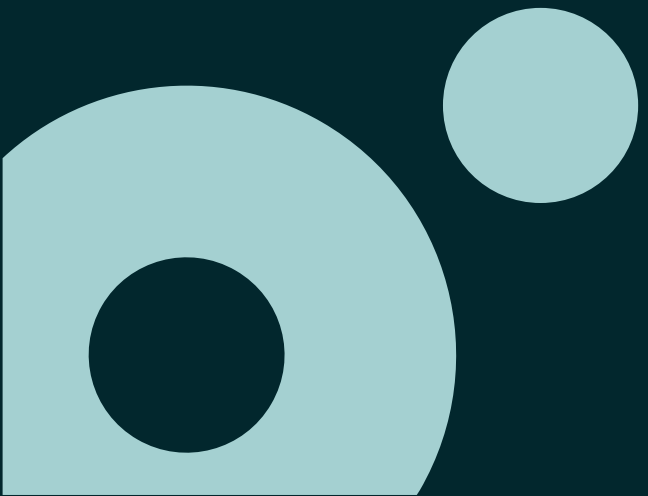
Ingress & Ingress Controller



Motivation

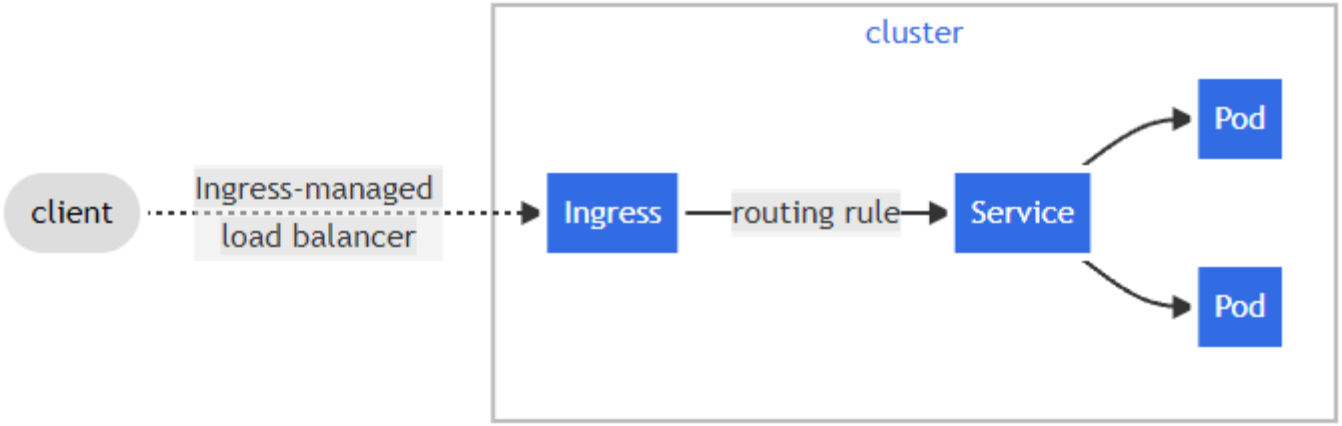
Ingress & Ingress Controller

- Creating several Load Balancer services will need several Public Ips to allow access to workloads
- Several issues on this approach
  - Several IPs to handle
  - Security with direct access to the cluster
  - SSL termination
- Needs to have a single ingress (inbound) connection from outside the cluster to inside services

Ingress

Ingress & Ingress Controller

- Exposes HTTP and HTTPS routes from outside the cluster to services within the cluster
- Traffic routing is controlled by rules defined on the Ingress resource



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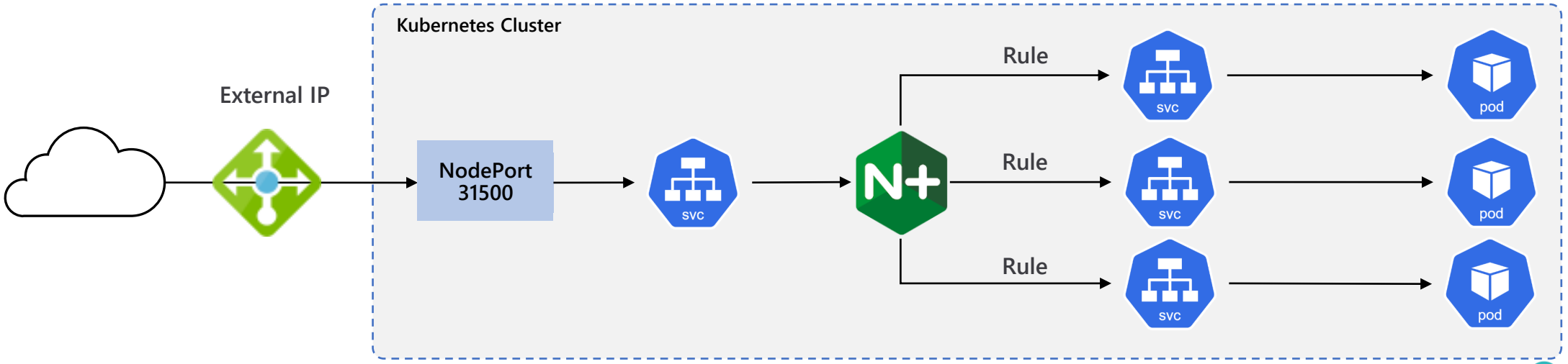
Ingress Controller

Ingress & Ingress Controller

- Kubernetes don't have concrete implementation for this routing
- Ingress are used by Ingress Controllers to implement the routing
- Most used
  - The NGINX Ingress Controller for Kubernetes works with the NGINX webserver (as a proxy).
  - The Traefik Kubernetes Ingress provider is an ingress controller for the Traefik proxy.



Ingress

```yaml
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: simple-fanout-example
spec:
  rules:
  - host: foo.bar.com
    http:
      paths:
      - path: /foo
        pathType: Prefix
        backend:
          service:
            name: service1
            port:
              number: 4200
      - path: /bar
        pathType: Prefix
        backend:
          service:
            name: service2
            port:
              number: 8080
```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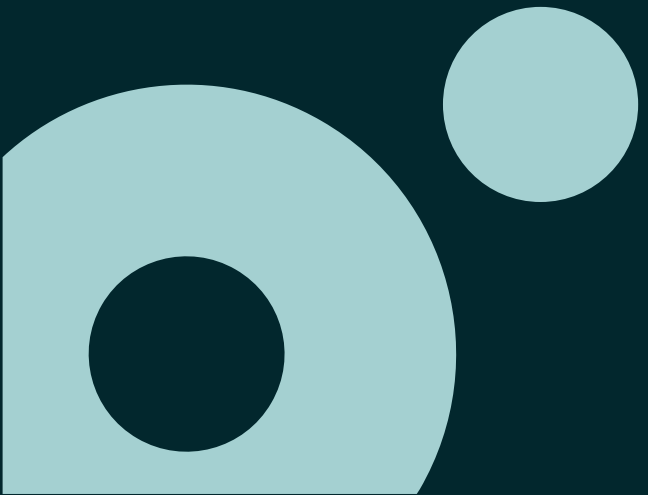
Lab



Lab 7: Managing services

Github

[Lab 07 - Managing services | docker-kubernetes-training (tasb.github.io)]

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Minds on the move

Rua Sousa Martins, nº 10
1050-218 Lisboa | Portugal