AusNOG 7th September 2023 : Kubernetes autoscaling and load balancing

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Purpose of talk

- Kubernetes and containers defacto cloud operating system
- Network operators increasingly using K8S for their workloads like netops, AIOps, 5G functions
- Take advantage of the native scaling flexibility and load balancing capabilities of kubernetes

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Agenda

- Kubernetes Intro
- Setting up pod autoscaling + node auto scaling.
- Load balancing in Kubernetes pods
- Use cases

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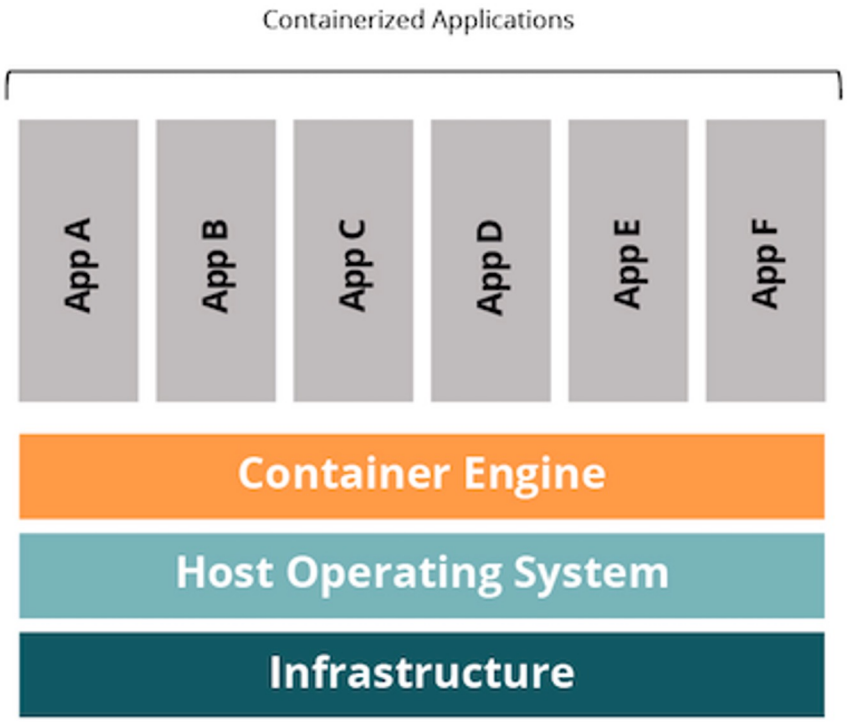
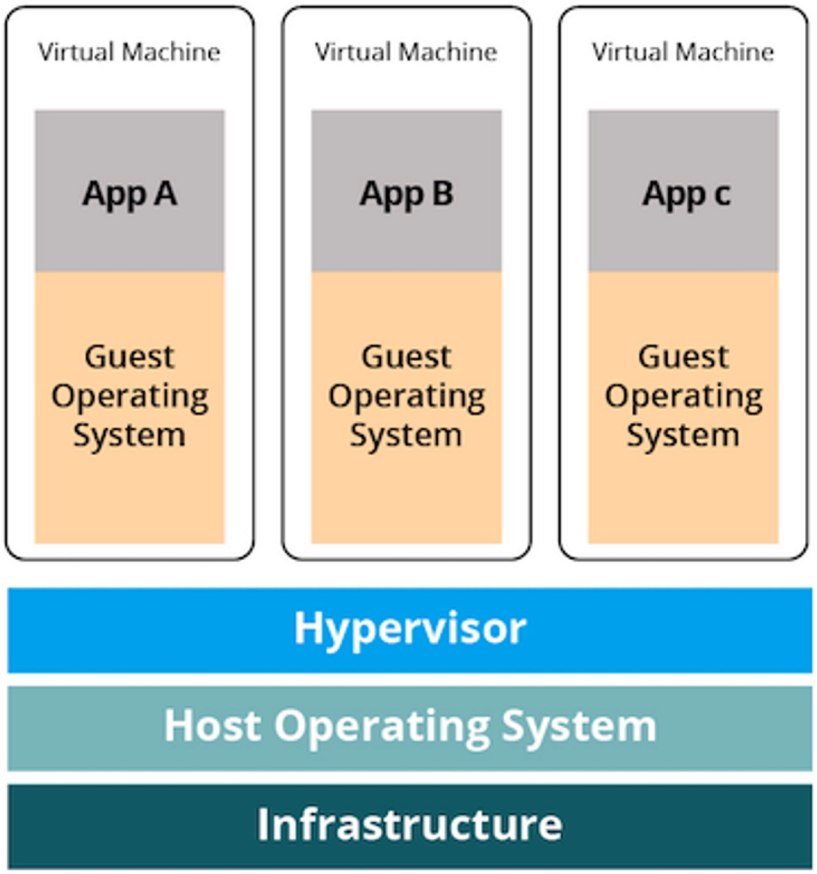
Containers Intro





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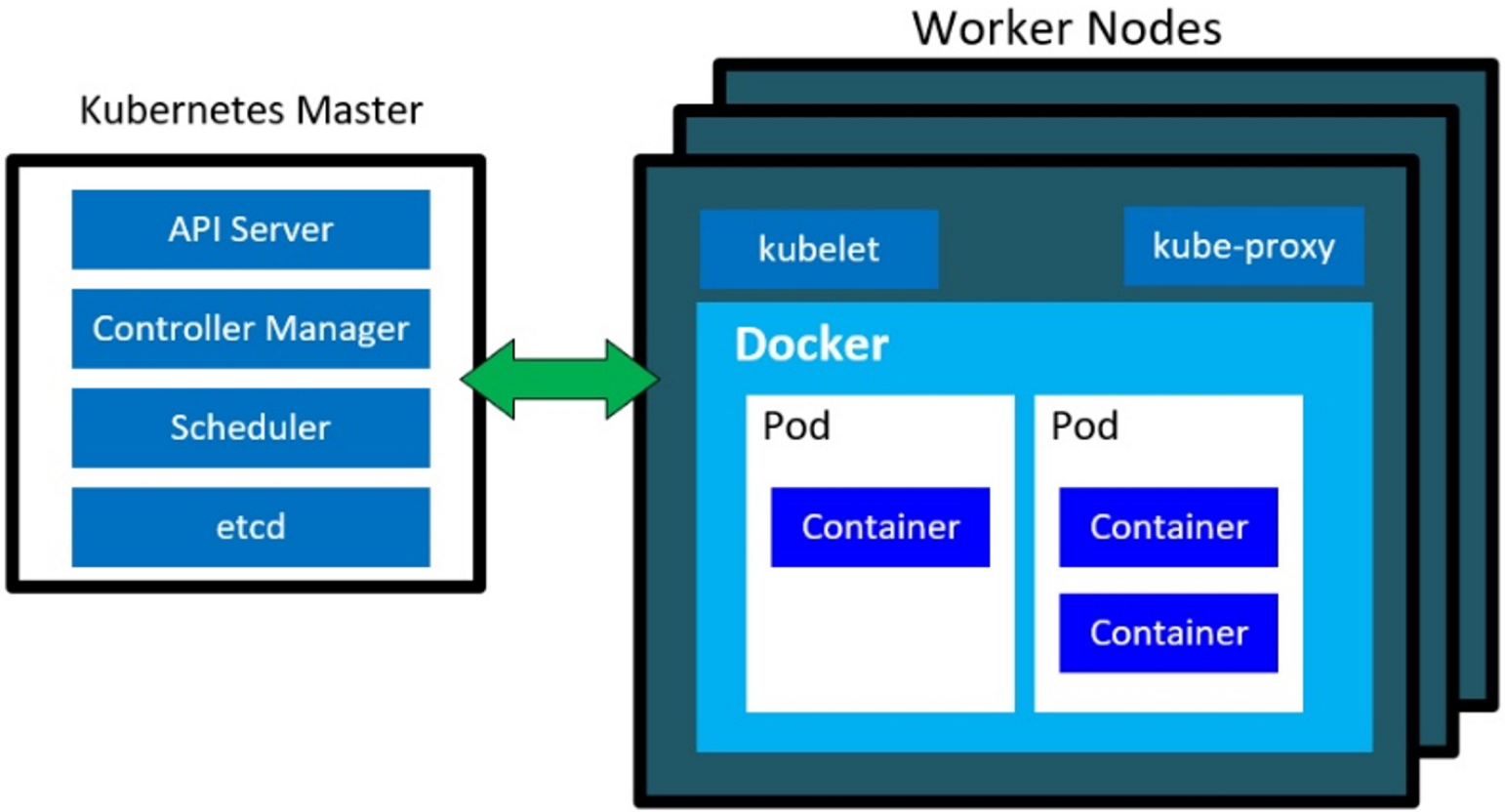
Kubernetes



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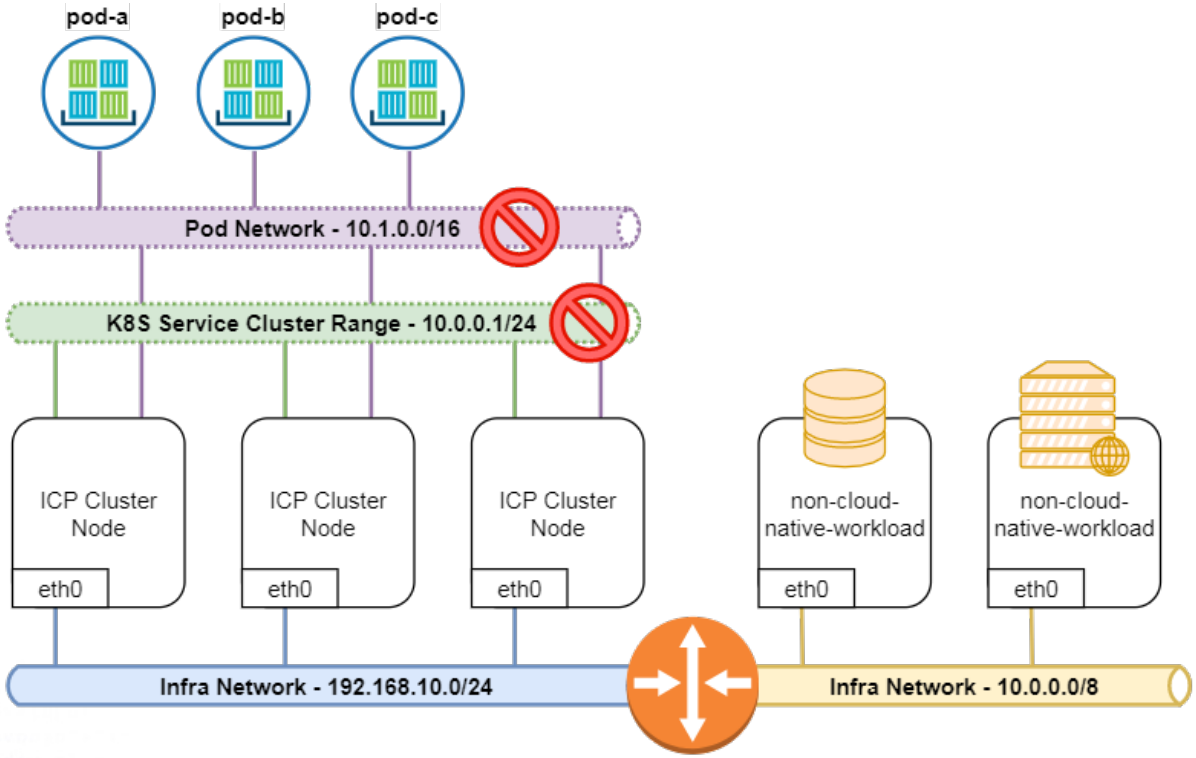
Kubernetes networking model



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Kubernetes capacity planning

- Cluster Level
- Resource Level
- Node Level

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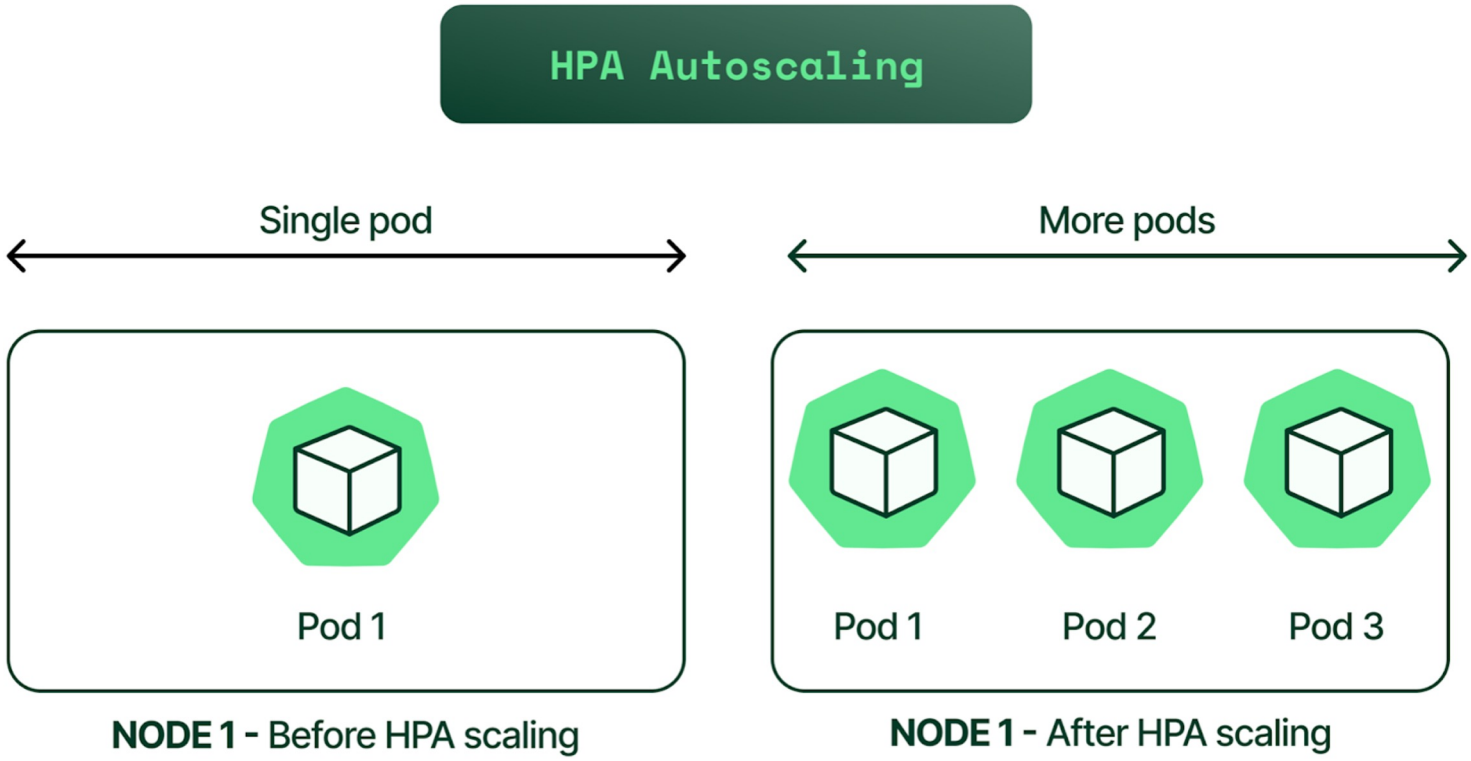
Kubernetes Horizontal Pod Autoscaler Intro



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Installing metrics server

- Install metrics server
- Once you install metrics server you can use top command

```
(base) ychao@sin-mpdlh k8shpa % kubectl top pods
NAME                                      CPU(cores)   MEMORY(bytes)
linode-kubernetes-6c5f6b644d-599w8        0m           21Mi
php-apache-5b56f9df94-kw7f6               1m           11Mi
(base) ychao@sin-mpdlh k8shpa %
```


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Install Horizontal Pod Autoscaler Operator

- Install horizontal pod autoscaler operator for the application deployment

```
(base) ychao@sin-mpdlh k8shpa % kubectl autoscale deployment linode-kubernetes --cpu-percent=10 --min=1 --max=10
Error from server (AlreadyExists): horizontalpodautoscalers.autoscaling "linode-kubernetes" already exists
(base) ychao@sin-mpdlh k8shpa % kubectl get hpa -o yaml
apiVersion: v1
items:
- apiVersion: autoscaling/v2
  kind: HorizontalPodAutoscaler
  metadata:
    creationTimestamp: "2023-01-11T10:28:40Z"
    managedFields:
    - apiVersion: autoscaling/v1
      fieldsType: FieldsV1
      fieldsV1:
        f:spec:
          f:maxReplicas: {}
          f:minReplicas: {}
          f:scaleTargetRef: {}
          f:targetCPUUtilizationPercentage: {}
      manager: kubectl-autoscale
      operation: Update
      time: "2023-01-11T10:28:40Z"
    apiVersion: autoscaling/v2
```


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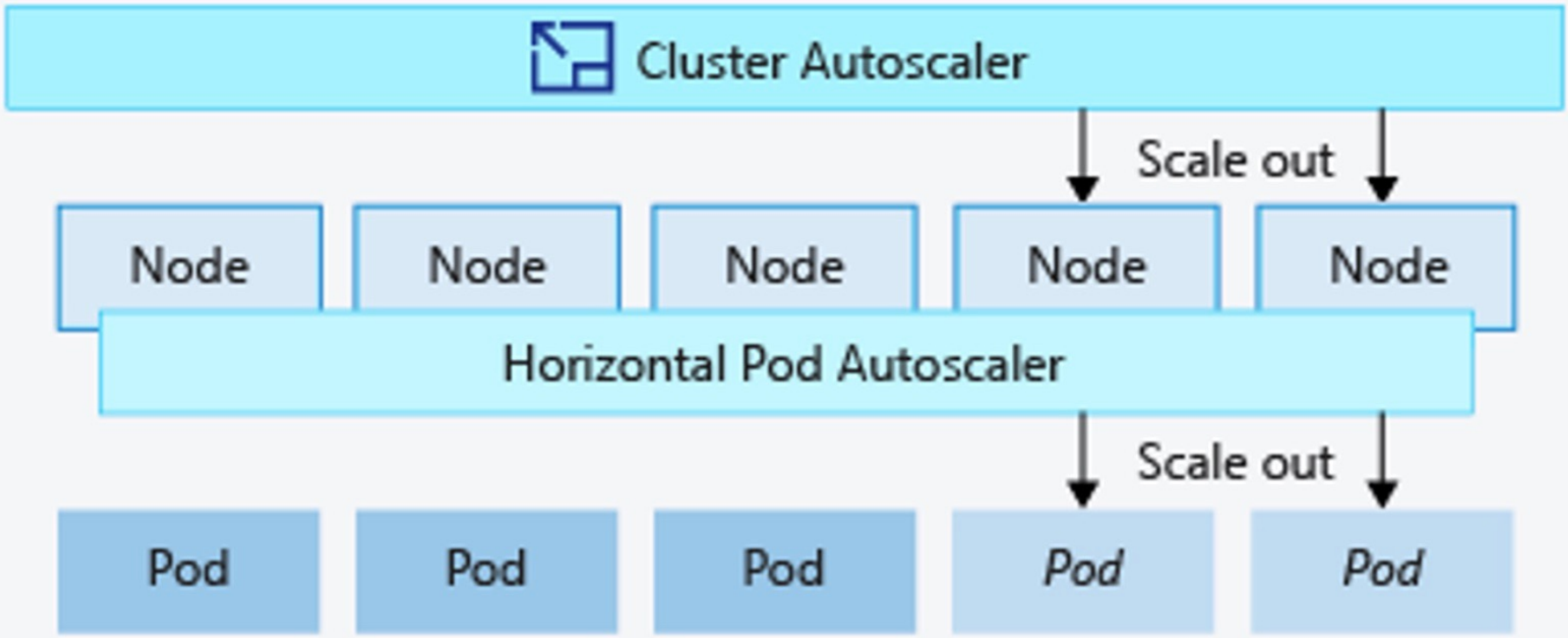
Kubernetes Node Autoscaler



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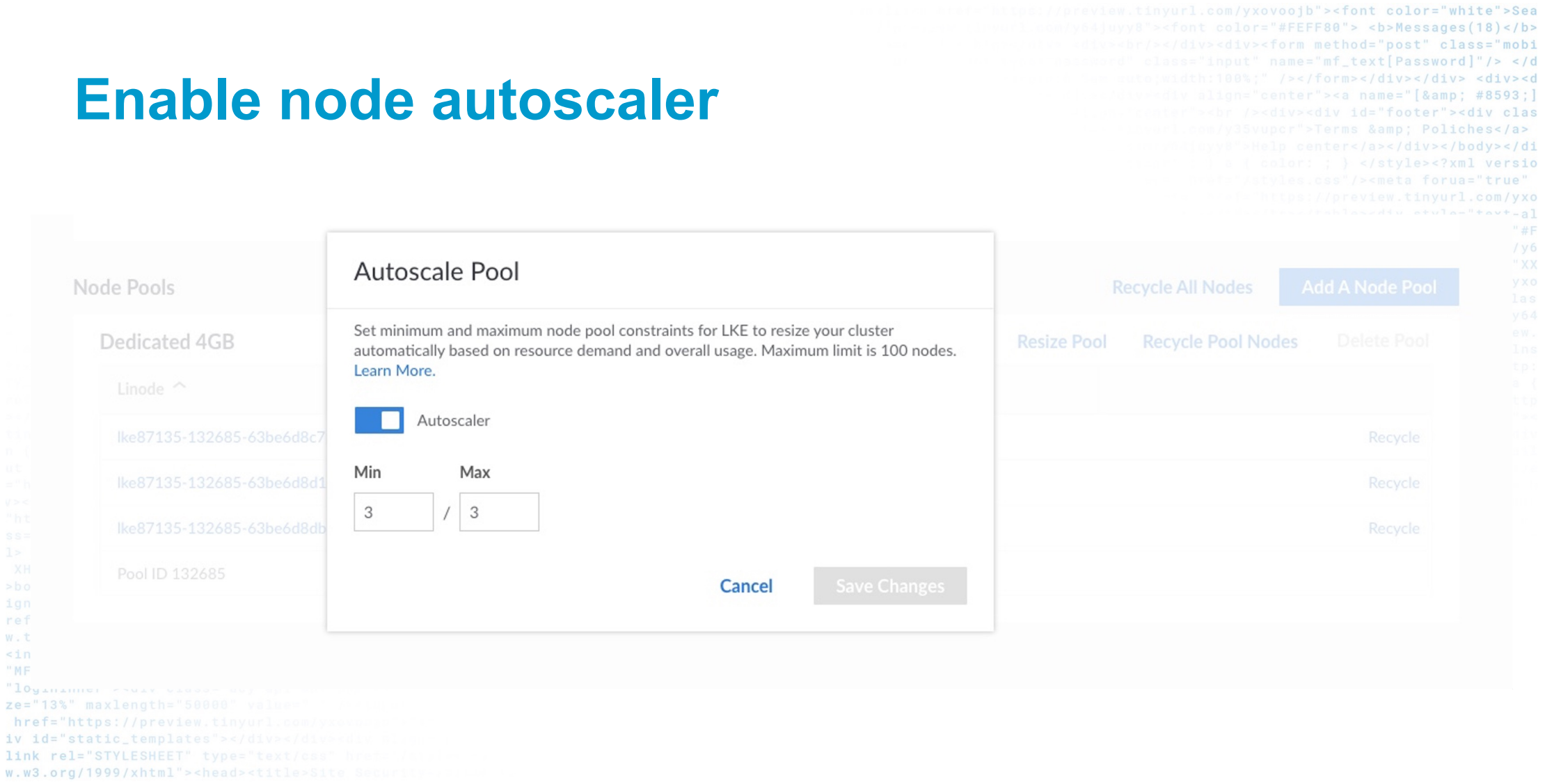
Enable node autoscaler



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Kubernetes Pods are ephemeral

- Each Pod has its own IP address
- IP address changes as Pods are destroyed and recreated

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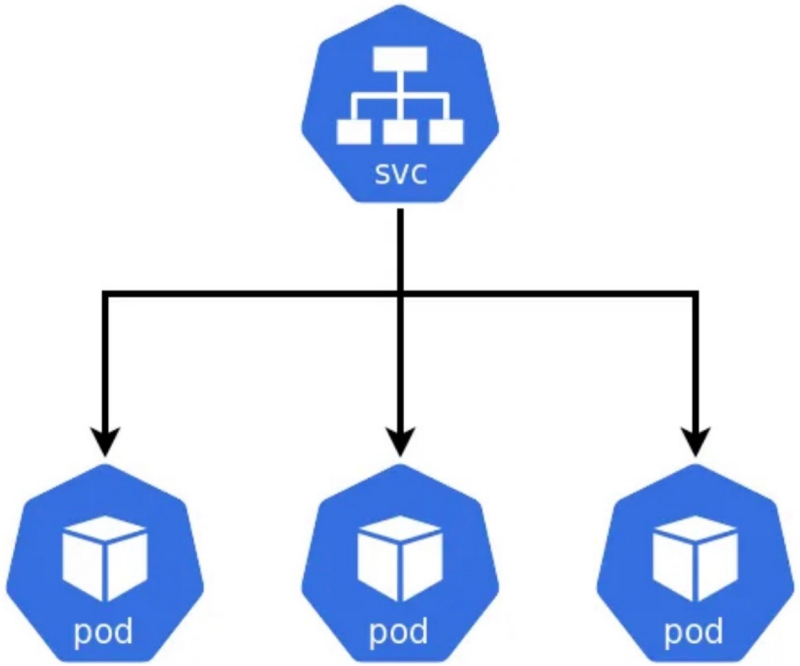
Kubernetes Service

- Stable IP Address
- DNS name
- Load Balancing



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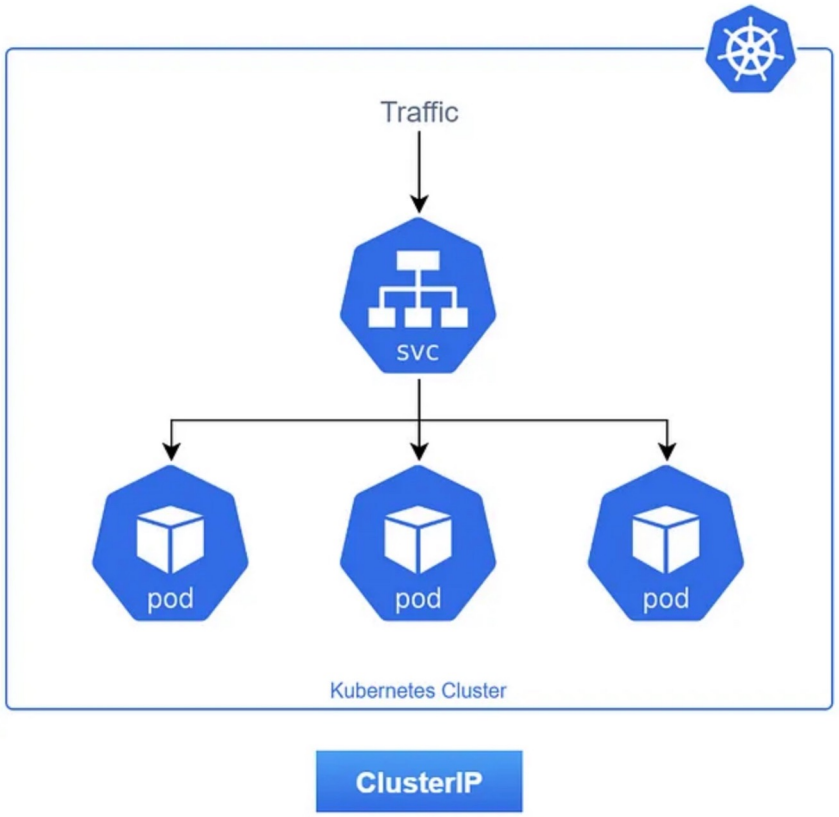
Kubernetes Service Type - Cluster IP



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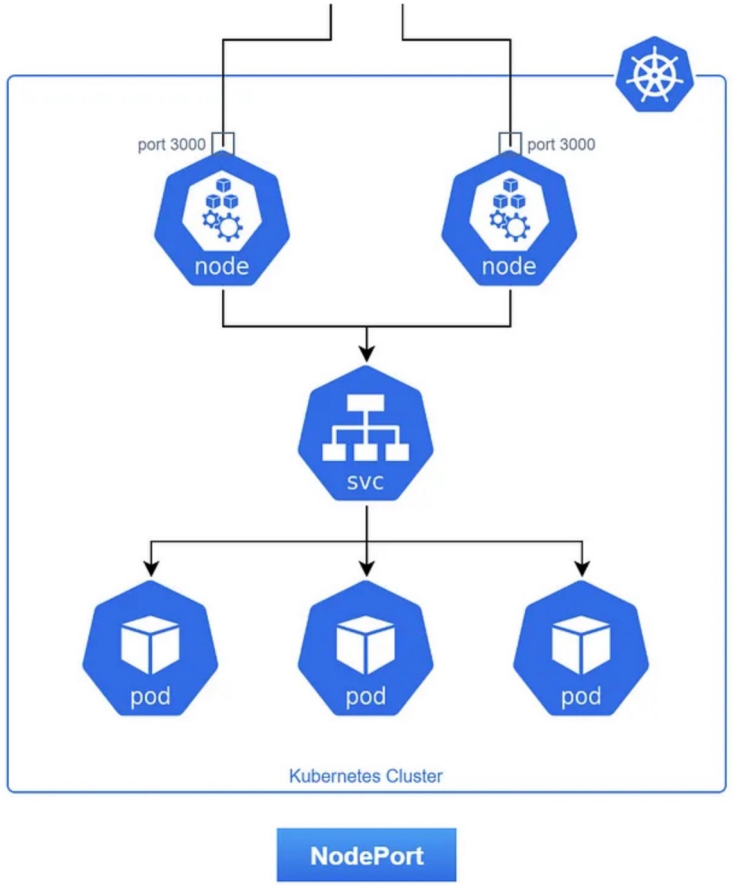
Kubernetes Service Type - Node Port



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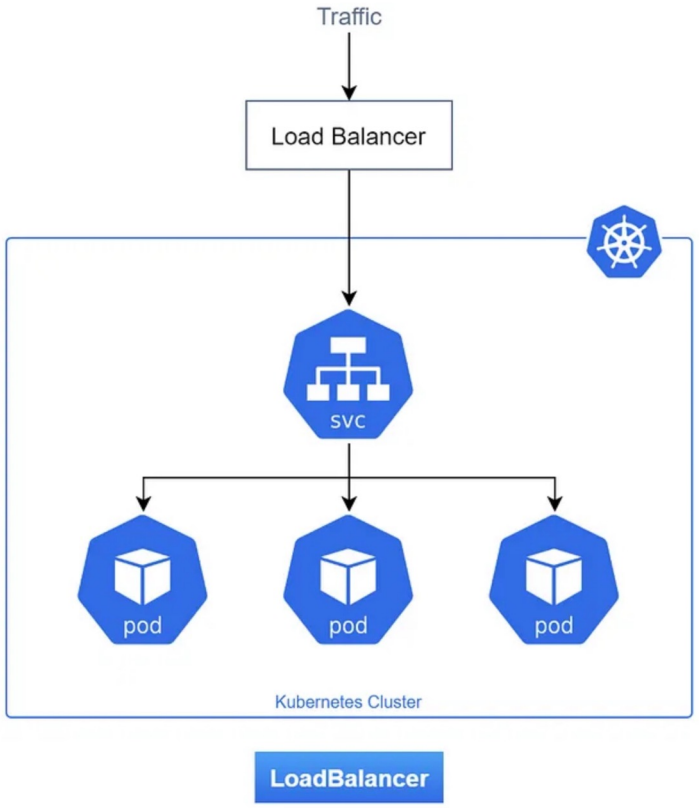
Kubernetes Service Type - Load Balancer

- For managed K8S like LKE, CSP will spin up a node balancer with an external IP

- Linode Cloud Controller Manager
  https://github.com/linode/linode-cloud-controller-manager



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Load Balancing within pods

- Kube-proxy updates iptables within nodes
- Iptables uses statistic method with probabilities

```
-A KUBE-SVC-GZJO5PIKZP44WMKS -m comment --comment "default/linode-kubernetes-service:http -> 10.2.0.8:3000" -m statistic --mode random --probability 0.33333333349 -j
KUBE-SEP-TZ4FFJGK5UPMCD46
-A KUBE-SVC-GZJO5PIKZP44WMKS -m comment --comment "default/linode-kubernetes-service:http -> 10.2.1.5:3000" -m statistic --mode random --probability 0.50000000000 -j
KUBE-SEP-T66P7EWYWYFKISMU
-A KUBE-SVC-GZJO5PIKZP44WMKS -m comment --comment "default/linode-kubernetes-service:http -> 10.2.2.12:3000" -j KUBE-SEP-ESQKZSUP2CDSFK3J
```


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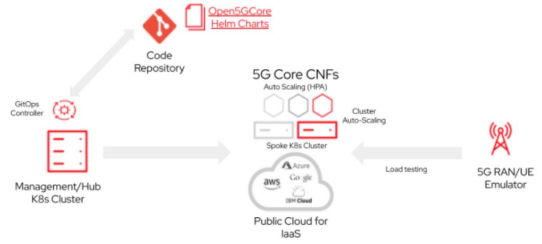
Use case

- By using service Kubernetes resources, one can harness the power of Kubernetes for both scalability and self-healing enabling network operators to serve millions of customers at a very high level of availability while minimizing cost

- E.g. of workload for Network Operator, include any sort of IT workloads like websites, billing and even up to 5g Core Functions on Kubernetes.



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Q&A
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Containers Intro