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Networking in Kubernetes

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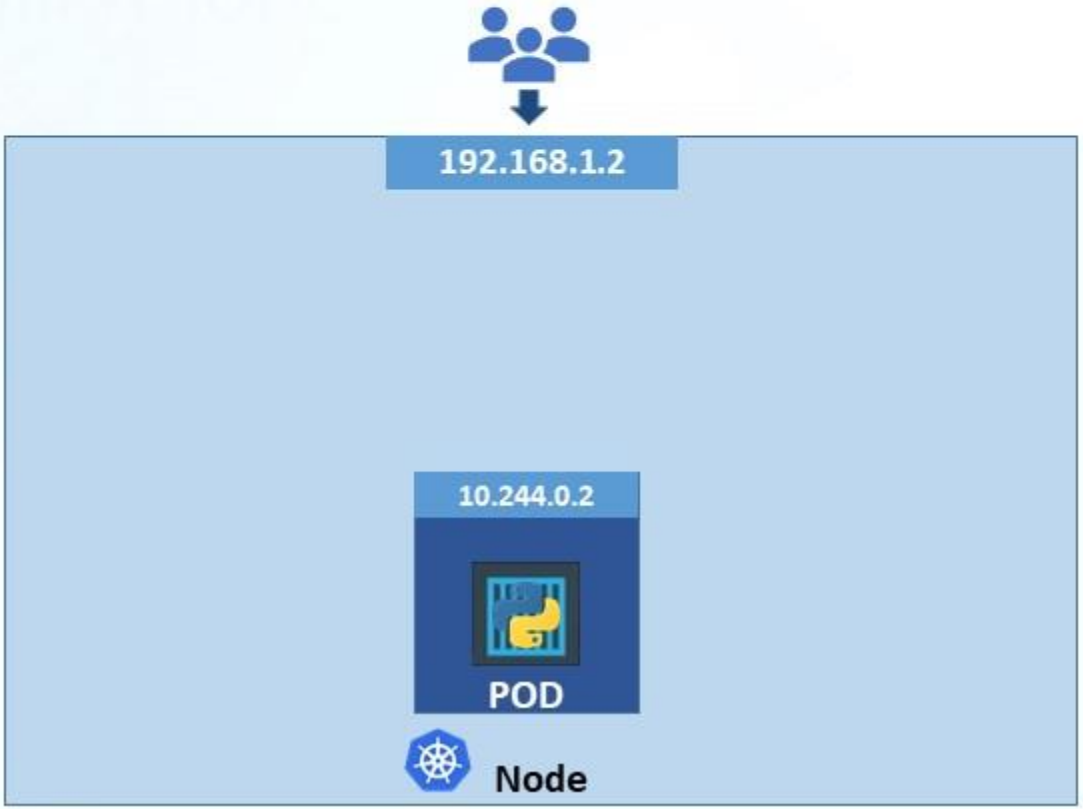
Kubernetes Networking

- Each node has an IP address.
- IP Address is assigned to a Pod



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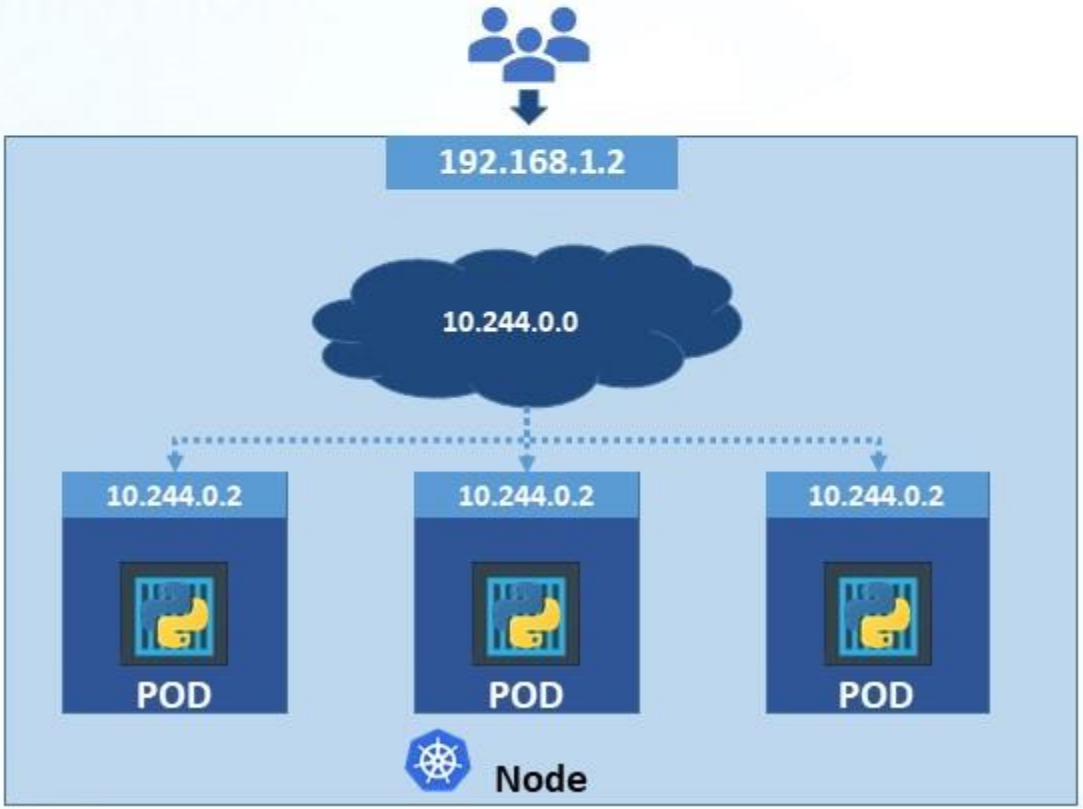
Kubernetes Networking

- How does Pod get an IP address?
- When Kubernetes is initially configured, it creates an internal private network with the address 10.2440.0
- When you deploy pods, they all are attached to it and get a separate IP assigned from this network.

The pods can communicate to each other through these IP but it is not recommended as it's subject to change when pods are recreated.



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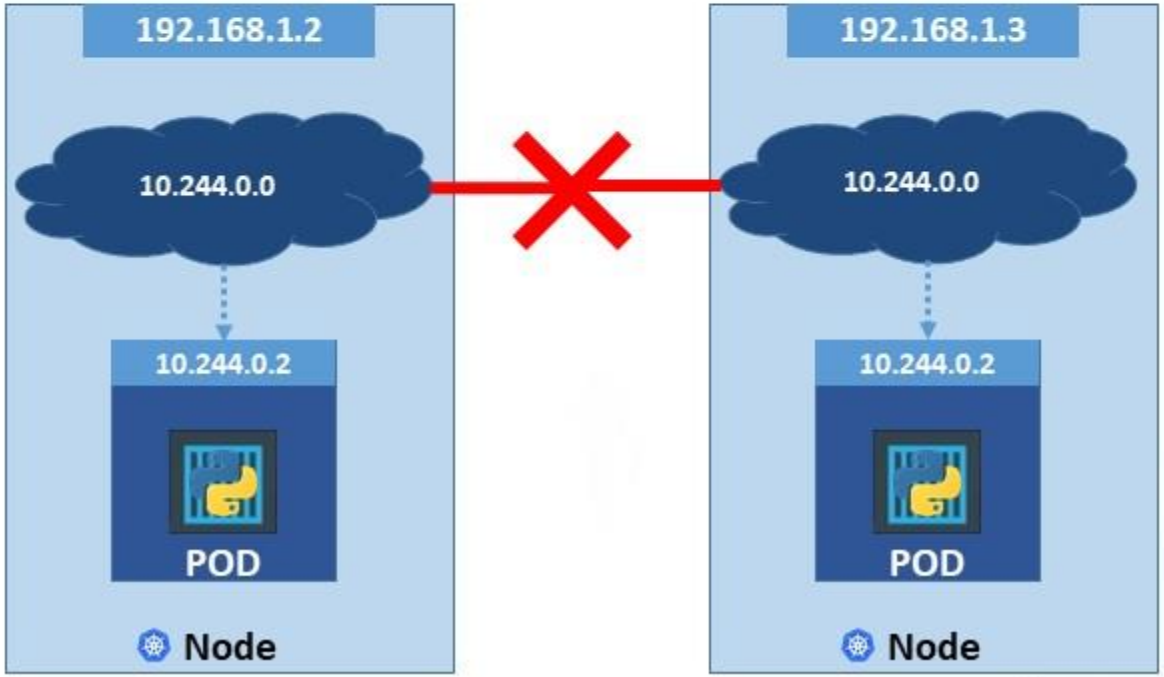
Cluster Networking

- How does it work when you have multiple nodes in your cluster?
- Let's say we have 2 nodes running Kubernetes. Separate nodes not as part of cluster
- Each of them has a single pod deployed and are attached to an internal network and they have their own IP addresses assigned.
- The two networks have an address 10.244.0.0 and the pods deployed have the same address too.

This is not going to work with the Nodes or Pod of the same cluster

This will lead to IP conflicts in the network.



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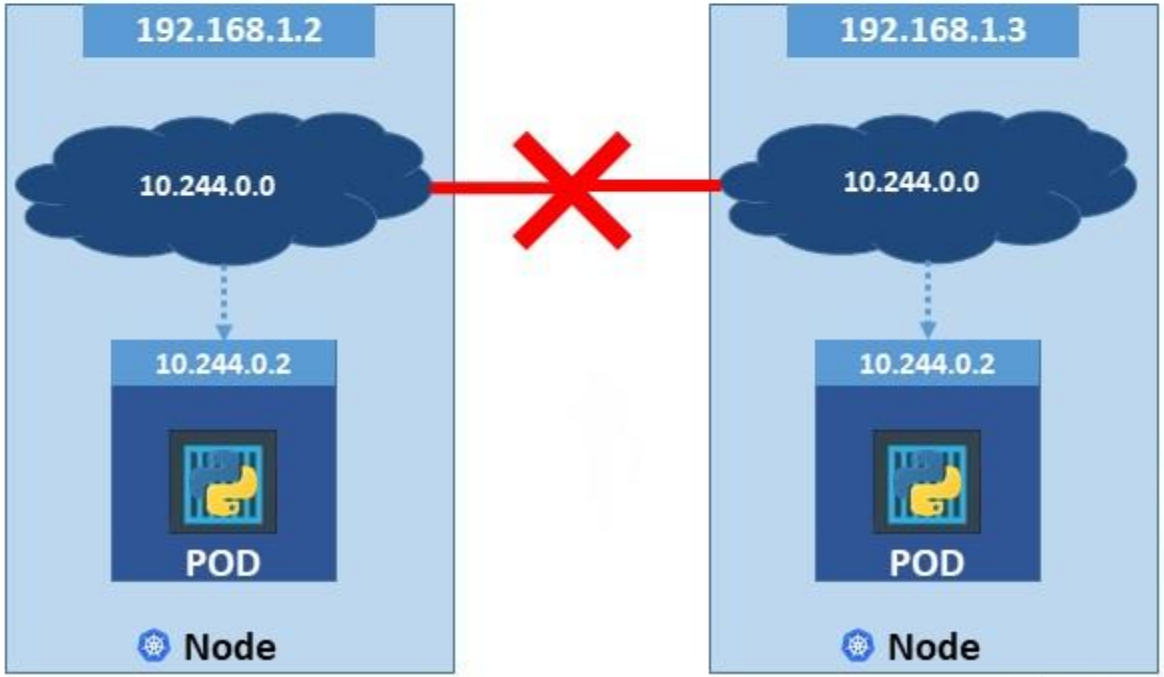
Cluster Networking

- Kubernetes does not automatically setup any kind of networking to handle these issues.
- Kubernetes expects us to set up networking to meet certain fundamental requirements in a Kubernetes cluster:
  - All the containers/Pods must be able to communicate with one another without NAT.
  - All nodes must be able to communicate with containers and vice-versa without NAT




CISCO


cilium


flannel


vmware
NSX

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(3/4) Installing a pod network

You **MUST** install a pod network add-on so that your pods can communicate with each other.

The network must be deployed before any applications. Also, kube-dns, an internal helper service, will not start up before a network is installed. kubeadm only supports Container Network Interface (CNI) based networks (and does not support kubenet).

Several projects provide Kubernetes pod networks using CNI, some of which also support Network Policy. See the add-ons page for a complete list of available network add-ons. IPv6 support was added in CNI v0.6.0. CNI bridge and local-ipam are the only supported IPv6 network plugins in 1.9.

Note: kubeadm sets up a more secure cluster by default and enforces use of RBAC. Please make sure that the network manifest of choice supports RBAC.

You can install a pod network add-on with the following command:

```
kubectl apply -f <add-on.yaml>
```

NOTE: You can install **only one** pod network per cluster.

Choose one... | Calico | Canal | Flannel | Kube-router | Romana | Weave Net

Refer to the Calico documentation for a kubeadm quickstart, a kubeadm installation guide, and other resources.

Note:

- In order for Network Policy to work correctly, you need to pass `--pod-network-cidr=192.168.0.0/16` to `kubeadm init`.
- Calico works on `amd64` only.

```
kubectl apply -f https://docs.projectcalico.org/v3.0/getting-started/kubernetes/installation/hosted/kubeadm/1.7/calico.yaml
```

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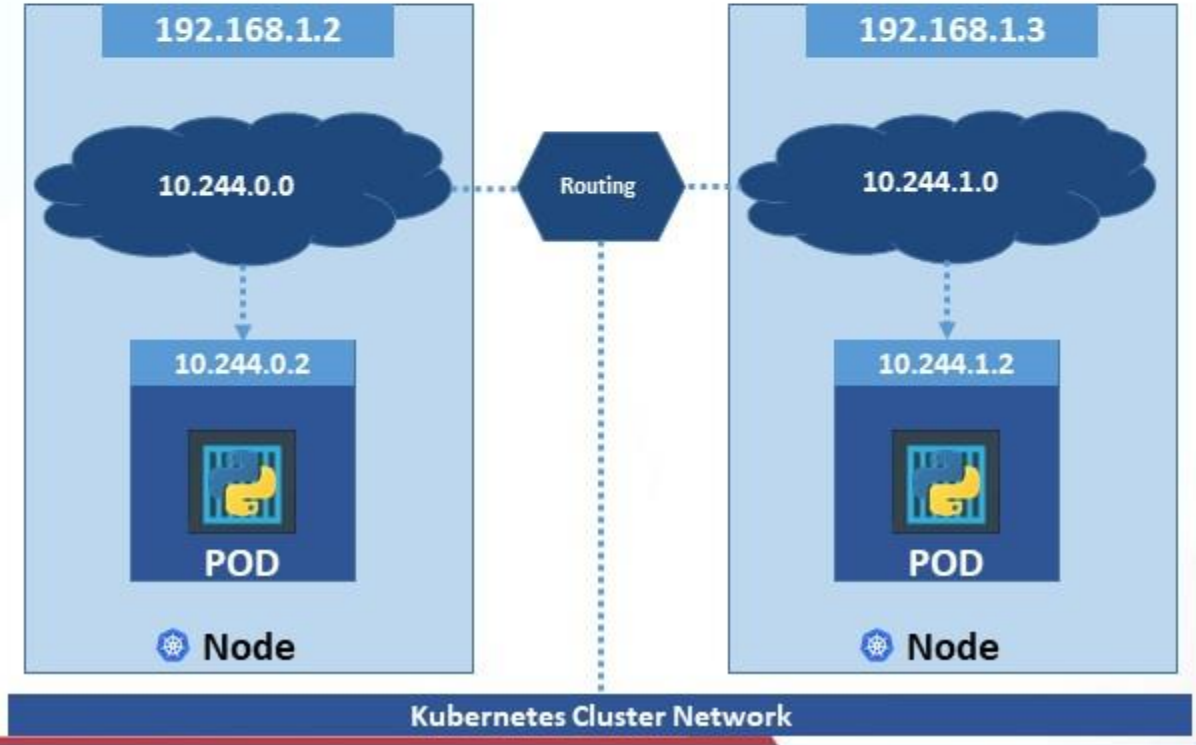
Cluster Networking

- When we use custom networking like Flannel
- It manages the networks and IPs in my nodes and assigns a different network address for each network in the node.
- This creates a virtual network of all pods and nodes where they are all assigned a unique IP address

- By using simple routing techniques the cluster networking enables communication between different pods or nodes to meet the networking requirements of Kubernetes.

- All the pods now can communicate to each other using the assigned IP address.



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Thank You