Adapting open source CNI plugins for IPAM

Parth Goswami

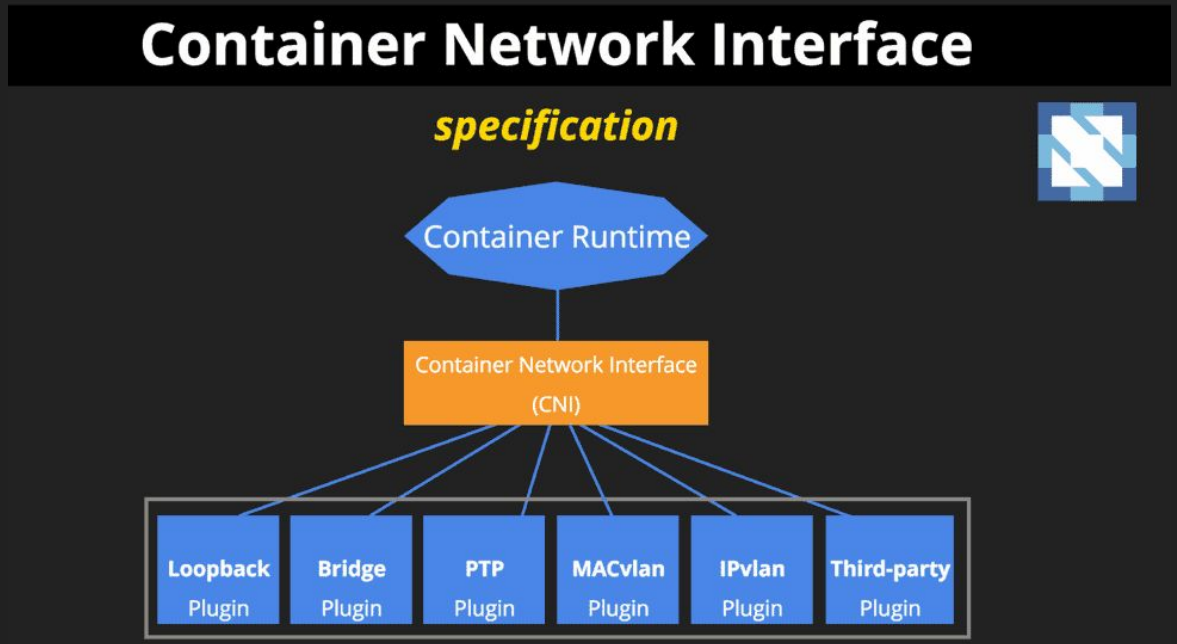
FOSSASIA Summit 2023

Agenda

- Container Networking Interface (CNI)
- Importance of CNI
- IP Address Management (IPAM)
- IPAM in Kubernetes
- Challenges presented by IP exhaustion
- Open source CNI plugins
- Adapting Open Source CNI Plugins for IPAM in k8s
- Case study
- Recap

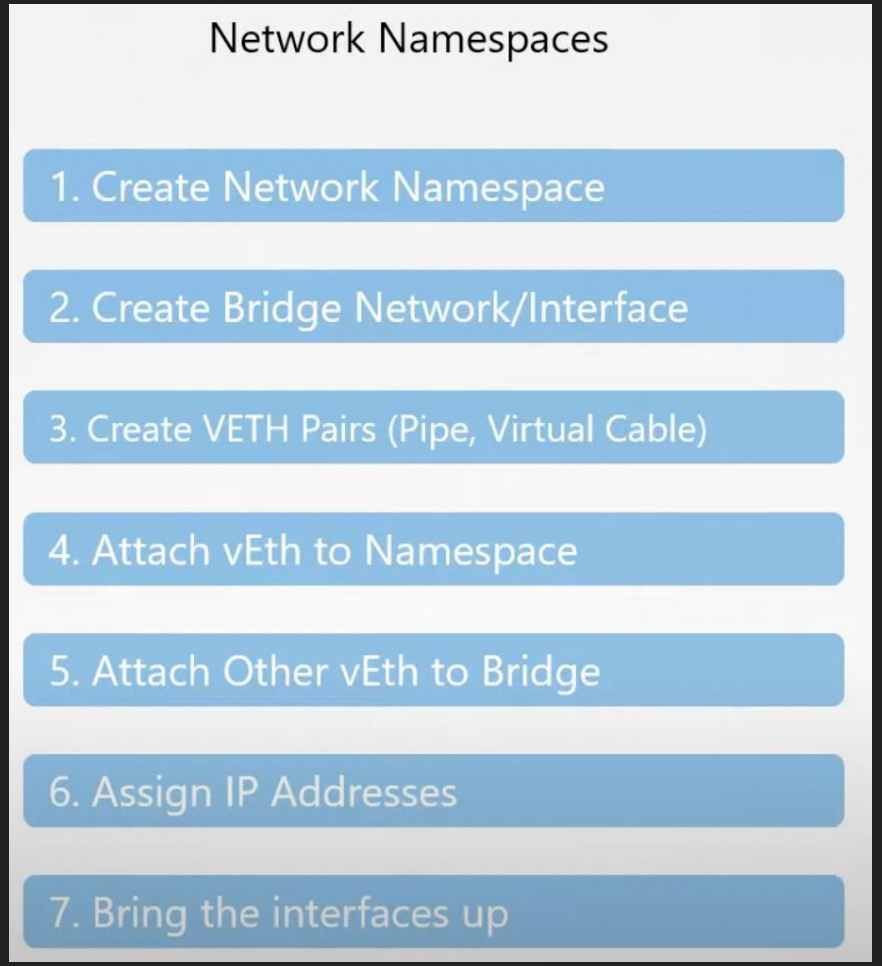
Container Networking Interface(CNI)

- Definitions of CNI:
  - The Container Networking Interface (CNI) is a specification that defines how to configure networking for Linux containers.



CNI

A sample program for network name spaces. A similar approach is followed by container orchestration solutions such as docker, rkt, MESOS, k8s.

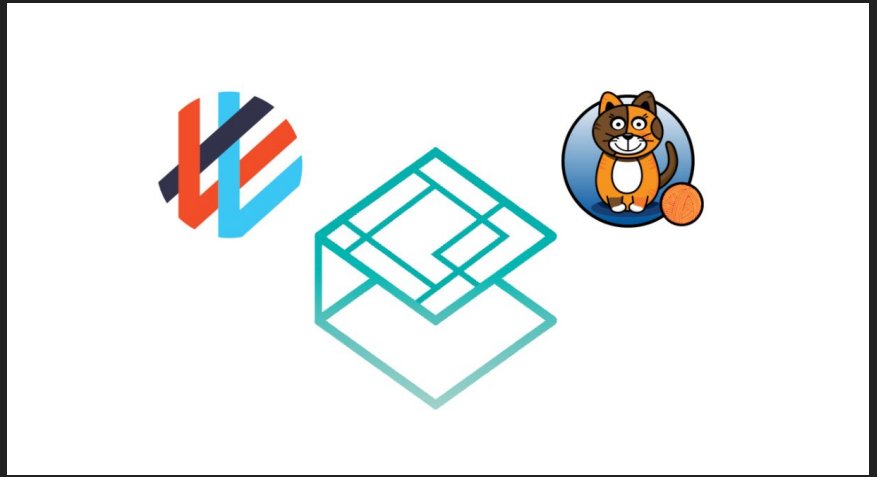


Roles of CNI

- Container Runtime must create network namespace
- Identify network the container must attach to
- Container Runtime to invoke Network Plugin (bridge) when container is ADDed.
- Container Runtime to invoke Network Plugin (bridge) when container is DELeted
- JSON format of the Network Configuration
- Must support command line arguments ADD/DEL/CHECK
- Must support parameters container id, network ns etc..
- Must manage IP Address assignment to PODs
- Must Return results in a specific format

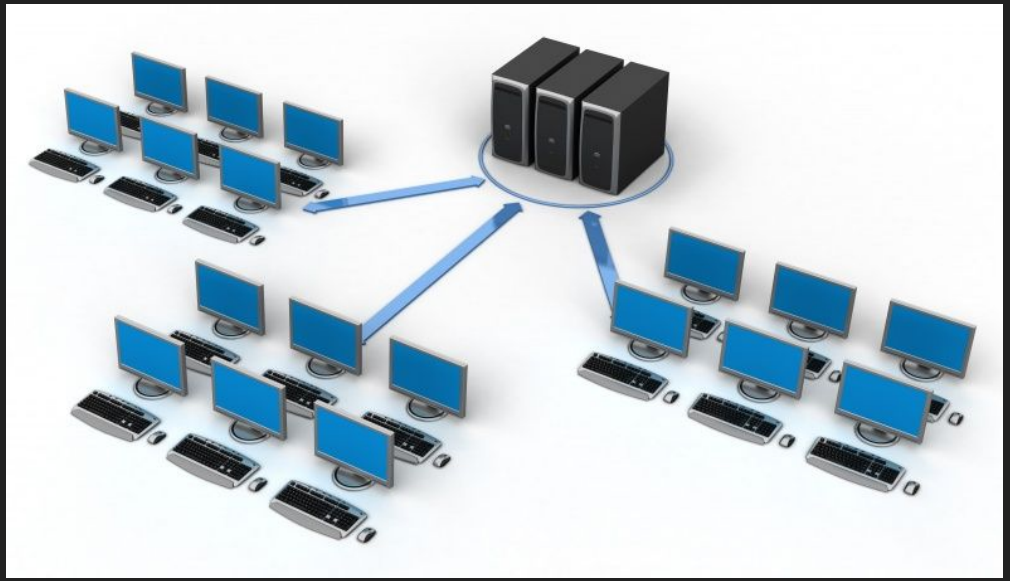
Container Networking Interface(CNI)

- Definitions of CNI:
  - The Container Networking Interface (CNI) is a specification that defines how to configure networking for Linux containers.
- Collection of a program or a code called Plug-in
- Example of plugins:
  - bridge, vlan, ipvlan, macvlan, dhcp, host-local
  - Calico, Weave Net, Flannel, Cilium, etc



IP Address Management (IPAM)

- Means of assigning, monitoring, tracking and managing IPs
- Integrates DHCP and DNS
- IP Address Management (IPAM) is an integrated suite of tools



IPAM in Kubernetes

- K8s uses IPAM plugin
- Default plugin, kube-proxy, comes with limitation

Challenges presented by IP exhaustion

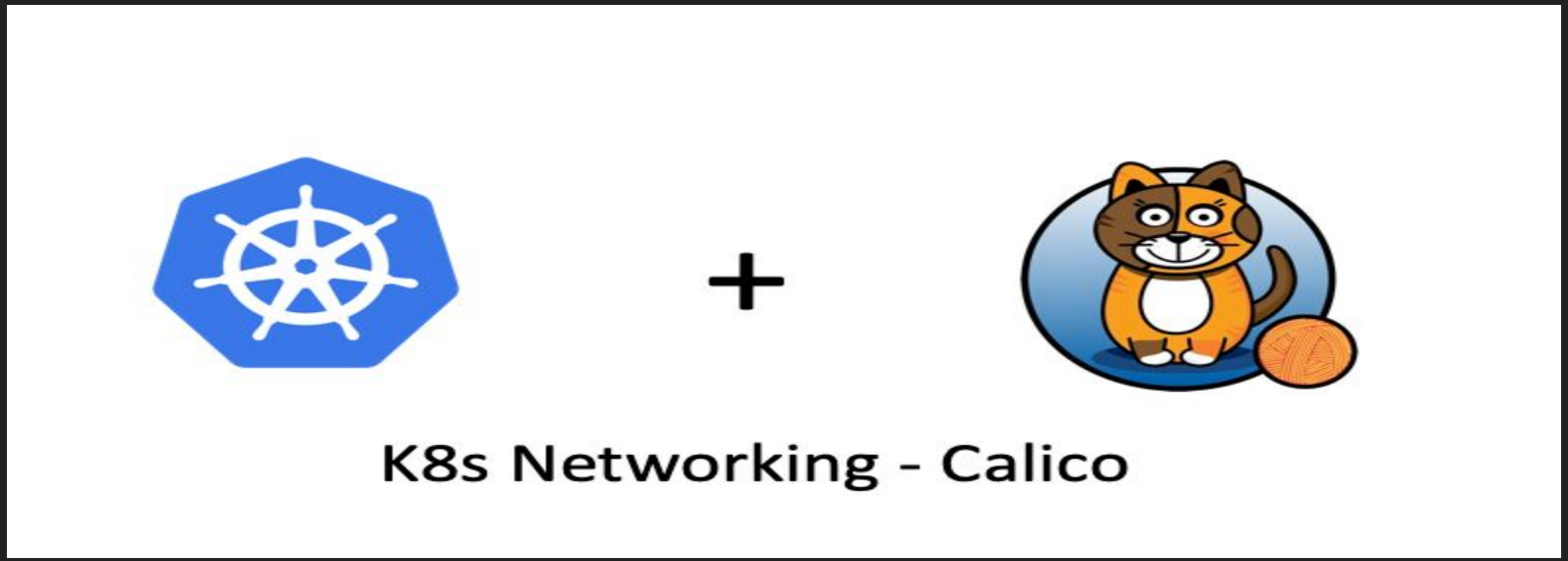
- Network congestion
- Security risk
- Difficulty in scaling
- Increased complexity

Adapting Open Source CNI Plugins for IPAM in k8s

- K8s uses built-in plugins
  - host-local
  - dhcp
- Limitations of built-in plugins
- K8s supports third-party IPAM plugins

calico-ipam

- Uses distributed IPAM architecture
- Network support using BGP
- Support for network security



Calico ambassadorship program

Recap

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About me

Parth Goswami
Calico Community Ambassador

parthgoswami.com


THANK YOU