

# Kube-OVN Document

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v1.15.0

*Kube-OVN Team*

*2025 Kube-OVN Team*

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## 1. Kube-OVN

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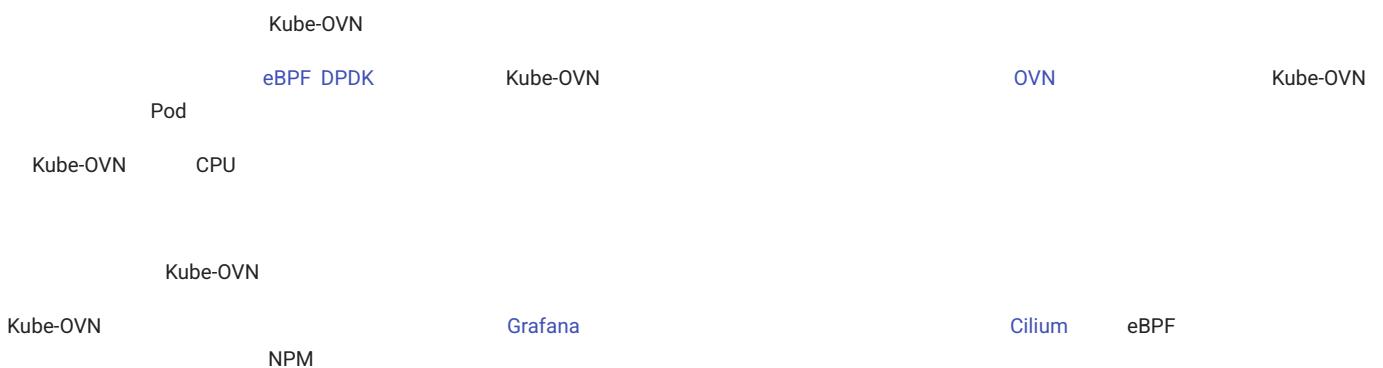
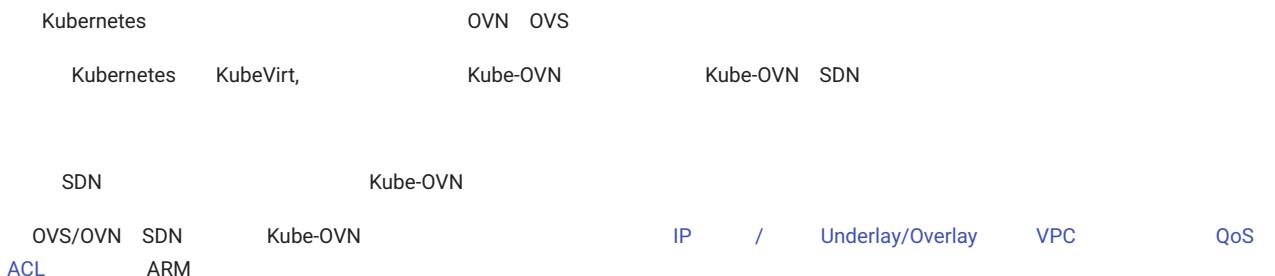
### 1.1 What is Kube-OVN?

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### 1.2 Why Kube-OVN?

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## 1.3 CNI

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### 1.3.1 eBPF

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[Cilium](#) [Calico eBPF](#)  
[Kube-OVN](#) [Open vSwitch](#)

### 1.3.2 CNI, Ingress, Service Mesh Observability All in One

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[Cilium](#)  
[Kube-OVN](#) CNI

### 1.3.3 OpenShift

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[ovn-kubernetes](#)  
[OpenShift](#) CNI [Cluster Network Operator](#) Kube-OVN RedHat Kubernetes

### 1.3.4 Kubernetes EKS/AKS/GKE

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Kubernetes CNI

### 1.3.5 AI

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Hostnetwork [host-device](#)  
AI

## 1.4 OVN/ovn-kubernetes/Kube-OVN

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### 1.4.1 OVN

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[OVN](#) Open vSwitch  
Kubernetes OpenStack, Kubernetes CMS ovn-kubernetes Kube-OVN OVN

### 1.4.2 ovn-kubernetes

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[ovn-kubernetes](#) OVN OVN Kubernetes CNI OpenShift OpenShift [UDN, Multihoming, Hardware Acceleration](#)

### 1.4.3 Kube-OVN

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Kube-OVN IP Namespace  
Underlay VPC KubeVirt OVN ovn-kubernetes annotation Pod join



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## 2.

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### 2.1

Kube-OVN CNI Kubernetes

#### 2.1.1

- Kubernetes >= 1.29
- Docker >= 1.12.6, Containerd >= 1.3.4
- : CentOS 7/8, Ubuntu 16.04/18.04/20.04
- Linux geneve, openvswitch, ip\_tables, iptable\_nat Kube-OVN

|    |                 |                           |                   |  |        |   |   |
|----|-----------------|---------------------------|-------------------|--|--------|---|---|
| 1. | 3.10.0-862      | netfilter                 | bug               | Kube-OVN                                 | CentOS | bug   | Floating IPs broken<br>after kernel upgrade to Centos/RHEL 7.5 - DNAT not working |
| 2. | Rocky Linux 8.6 | 4.18.0-372.9.1.el8.x86_64 | TCP               | TCP connection failed in Rocky Linux 8.6 |        | 4.18.0-372.13.1.el8_6.x86_64                    |   |
| 3. | 4.4             | openvswitch               |                   | openvswitch                              |        |   |   |
| 4. | Geneve          | IPv6                      | cat /proc/cmdline |  | bug    | Geneve tunnels don't work when ipv6 is disabled |   |

#### 2.1.2

- IPv6 ipv6.disable=1 0
- kube-proxy Kube-OVN Service ClusterIP kube-apiserver
- kubelet CNI , kubelet --network-plugin=cni --cni-bin-dir=/opt/cni/bin --cni-conf-dir=/etc/cni/net.d /etc/cni/net.d/

#### 2.1.3

|                     |   |                     |
|---------------------|---|---------------------|
| ovn-central         | 6641/tcp                                      | ovn nb db server    |
| ovn-central         | 6642/tcp                                      | ovn sb db server    |
| ovn-central         | 6643/tcp                                      | ovn northd server   |
| ovn-central         | 6644/tcp                                      | ovn raft server     |
| ovn-ic              | 6645/tcp                                      | ovn ic nb db server |
| ovn-ic              | 6646/tcp                                      | ovn ic sb db server |
| ovs-ovn             | Geneve 6081/udp, STT 7471/tcp, Vxlan 4789/udp |                     |
| kube-ovn-controller | 10660/tcp                                     |                     |
| kube-ovn-daemon     | 10665/tcp                                     |                     |
| kube-ovn-monitor    | 10661/tcp                                     |                     |

firewalld Packet Forwarding Masquerade

```
# Packet Forwarding
firewall-cmd --add-forward --permanent
```

```
#   IPv4 Masquerade
firewall-cmd --add-masquerade --permanent
#   Kube-OVN IPv6/           Masquerade
firewall-cmd --permanent --add-rich-rule 'rule family="ipv6" source address="fd00:10:16::/112" masquerade'

firewall-cmd --reload
```

[!\[\]\(7e49c700e4adaed94ad5398cf2e7059e\_img.jpg\) PDF](#)[!\[\]\(5ebcf382a6ee952d6c5b8b948415801e\_img.jpg\) Slack](#)[!\[\]\(71ceb62b681518c82e95d615e7265d66\_img.jpg\) Support](#)

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2.1.4

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## 2.2



### 2.2.1

release

```
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/refs/tags/v1.15.0/dist/images/install.sh
```

master

```
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/images/install.sh
```

```

REGISTRY="kubeovn"
VERSION="v1.15.0"
#           # /Tag
POD_CIDR="10.16.0.0/16"      # CIDR      SVC/NODE/JOIN CIDR
SVC_CIDR="10.96.0.0/12"       # apiserver  service-cluster-ip-range
JOIN_CIDR="100.64.0.0/16"     # Pod        CIDR      SVC/NODE/POD CIDR
LABEL="node-role.kubernetes.io/master" # OVN DB
IFACE=""                      #                 Kubernetes   Node IP
TUNNEL_TYPE="geneve"          #             geneve, vxlan   stt stt   ovs

```

IFACE=enp6s0f0,eth.\*

root

```
bash install.sh
```

Kube-OVN

1. [Step 4/6] Pod
2. Kube-OVN

### 2.2.2 Helm Chart

Kube-OVN      Helm      Kube-OVN

IP

```
# kubectl get node -o wide
NAME           STATUS    ROLES      AGE   VERSION   INTERNAL-IP   EXTERNAL-IP   OS-IMAGE      KERNEL-VERSION   CONTAINER-RUNTIME
kube-ovn-control-plane  NotReady  control-plane  20h  v1.26.0  172.18.0.3  <none>        Ubuntu 22.04.1 LTS  5.10.104-linuxkit  containerd://1.6.9
kube-ovn-worker    NotReady  <none>      20h  v1.26.0  172.18.0.2  <none>        Ubuntu 22.04.1 LTS  5.10.104-linuxkit  containerd://1.6.9
```

**label**

```
# kubectl label node -lbeta.kubernetes.io/os=linux kubernetes.io/os=linux --overwrite
node/kube-ovn-control-plane not labeled
node/kube-ovn-worker not labeled

# kubectl label node -lnode-role.kubernetes.io/control-plane kube-ovn/role=master --overwrite
node/kube-ovn-control-plane labeled

#   label    dpdk      dpdk
# kubectl label node -lvn.kubernetes.io/ovs_dp_type!=userspace ovn.kubernetes.io/ovs_dp_type=kernel --overwrite
node/kube-ovn-control-plane labeled
node/kube-ovn-worker labeled
```

**Helm Repo**

```
# helm repo add kubeovn https://kubeovn.github.io/kube-ovn/
" kubeovn " has been added to your repositories

# helm repo list
NAME          URL
kubeovn      https://kubeovn.github.io/kube-ovn/

# helm repo update kubeovn
Hang tight while we grab the latest from your chart repositories...
...Successfully got an update from the " kubeovn " chart repository
Update Complete. *Happy Helm-ing!*

# helm search repo kubeovn
NAME          CHART VERSION   APP VERSION   DESCRIPTION
kubeovn/kube-ovn   v1.15.0       v1.15.0       Helm chart for Kube-OVN
```

**helm install Kube-OVN**

Chart      values.yaml

```
# helm install kube-ovn kubeovn/kube-ovn --wait -n kube-system --version v1.15.0
NAME: kube-ovn
LAST DEPLOYED: Thu Apr 24 08:30:13 2025
NAMESPACE: kube-system
STATUS: deployed
REVISION: 1
TEST SUITE: None
```

**Helm**      values.yaml

```
helm upgrade -f values.yaml kube-ovn kubeovn/kube-ovn --wait -n kube-system --version v1.15.0
```

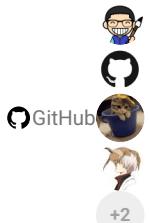
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 Support

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**2.2.3**

## 2.3 Underlay

Kube-OVN      Geneve      Overlay  
                   Kube-OVN      Underlay



### 2.3.1

Overlay      SNAT/EIP      /      L3      VPC      Underlay

### 2.3.2 Macvlan

Kube-OVN      Underlay      Macvlan

1. Macvlan      OVS      Macvlan
2. Kube-OVN      arp-proxy      arp
3. Macvlan      netfilter Service      NetworkPolicy      Kube-OVN      OVS      Service      NetworkPolicy
4. Kube-OVN      Underlay      Macvlan      IP      QoS

### 2.3.3

| Underlay          | OVS               | OVS                                   | L2/L3                      | Vlan    |
|-------------------|-------------------|---------------------------------------|----------------------------|---------|
| 1. OpenStack VM   |                   | PortSecurity                          |                            |         |
| 2. VMware vSwitch |                   | MAC Address Changes, Forged Transmits | Promiscuous Mode Operation | allow   |
| 3. VMware NSX-T   | Underlay          |                                       |                            |         |
| 4. Hyper-V        |                   | MAC Address Spoofing                  |                            |         |
| 5. AWS GCE        | Mac               | Underlay                              | Underlay                   | VPC-CNI |
| 6. Linux Bridge   |                   |                                       |                            |         |
|                   | Kube-OVN Underlay |                                       | Underlay                   |         |
|                   | Underlay          |                                       |                            |         |
|                   | Kube-OVN          | Mac                                   | IP                         | MTU     |
| PROVIDER_NAME     | ProviderNetwork   |                                       | provider                   |         |
| 1.                | OVS Bridge        | NetworkManager                        |                            | DHCP    |
| 2.                | OVS Bridge        | OVS                                   | Kube-OVN                   | OVS     |
|                   | Underlay          |                                       |                            |         |

### 2.3.4

Underlay      Pod      Underlay

```
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/release-1.15/dist/images/install.sh
```

```
ENABLE_ARP_DETECT_IP_CONFLICT #      vlan    arp
NETWORK_TYPE #      vlan
VLAN_INTERFACE_NAME #      eth1
VLAN_ID #      VLAN Tag    0    VLAN
POD_CIDR #      CIDR    192.168.1.0/24
POD_GATEWAY #      192.168.1.1
EXCLUDE_IPS #
ENABLE_LB #      Underlay   Service  true
EXCHANGE_LINK_NAME #
LS_DNAT_MOD_DL_DST #  DNAT     MAC      Service  true
```

```
bash install.sh
```

### 2.3.5 CRD      Underlay

Underlay      Pod      ProviderNetwork      Vlan      Subnet

#### ProviderNetwork

ProviderNetwork      Underlay

ProviderNetwork :

```
apiVersion: kubeovn.io/v1
kind: ProviderNetwork
metadata:
  name: net1
```

```

spec:
  defaultInterface: eth1
  customInterfaces:
    - interface: eth2
      nodes:
        - node1
  nodeSelector:
    matchLabels:
      kubernetes.io/arch: amd64
      network-type: underlay
    matchExpressions:
      - key: kubernetes.io/hostname
        operator: In
        values:
          - node1
          - node2

```

## ProviderNetwork 12

|                                | Bond  | Vlan | ProviderNetwork                                      | excludeNodes         | br-net1 | br-NAME      |
|--------------------------------|-------|------|--|----------------------|---------|--------------|
| • defaultInterface:            | OVS   |      |  |                      |         |              |
| • customInterfaces:            |       |      |  |                      |         |              |
| • nodeSelector:                | OVS   |      | matchLabels  | matchExpressions     |         |              |
| • excludeNodes:                |       |      | net1.provider-network.ovn.kubernetes.io/exclude=true |                      |         | nodeSelector |
| excludeNodes                   |       |      | nodeSelector   |                      |         |              |
| • autoCreateVlanSubinterfaces: | false | true | VLAN   | <interface>.<vlanid> |         |              |

| Key   | Value |                 |
|---|-------|-----------------|
| net1.provider-network.ovn.kubernetes.io/ready     | true  | ProviderNetwork |
| net1.provider-network.ovn.kubernetes.io/interface | eth1  |                 |
| net1.provider-network.ovn.kubernetes.io/mtu       | 1500  | MTU             |

IP IP OVS

## VLAN

ProviderNetwork autoCreateVlanSubinterfaces: true VLAN VLAN

```

apiVersion: kubeovn.io/v1
kind: ProviderNetwork
metadata:
  name: vlan-provider
spec:
  defaultInterface: eth0.341
  autoCreateVlanSubinterfaces: true
  customInterfaces:
    - interface: eth2.341
      nodes:
        - worker-node-1
        - worker-node-2

```

<interface>.<vlanid> VLAN VLAN ProviderNetwork

## VLAN

Vlan Vlan Tag ProviderNetwork

VLAN

```

apiVersion: kubeovn.io/v1
kind: Vlan
metadata:

```

```

  name: vlan1
spec:
  id: 0
  provider: net1

```

|             |                 |          |      |      |   |                 |          |
|-------------|-----------------|----------|------|------|---|-----------------|----------|
| • id:       | VLAN ID/Tag     | Kube-OVN | Vlan | Vlan | 0 | vlan            | localnet |
| • provider: | ProviderNetwork |          | VLAN |      |   | ProviderNetwork |          |

## Subnet

### Vlan

```

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: subnet1
spec:
  protocol: IPv4
  cidrBlock: 172.17.0.0/16
  gateway: 172.17.0.1
  vlan: vlan1
  disableGatewayCheck: false

```

|                       |          |        |      |
|-----------------------|----------|--------|------|
| • vlan                | VLAN     | Subnet | VLAN |
| • disableGatewayCheck | Underlay |        | true |

## 2.3.6

### IP

IP Pod IP Mac

## 2.3.7

Kube-OVN Underlay spec.logicalGateway true

```

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: subnet1
spec:
  protocol: IPv4
  cidrBlock: 172.17.0.0/16
  gateway: 172.17.0.1
  vlan: vlan1
  logicalGateway: true

```

Pod Kube-OVN Logical Router

## 2.3.8 Underlay Overlay

| Underlay | Overlay | Overlay            | Pod      | NAT      | Underlay | Pod IP      | Underlay | Pod         | Overlay |
|----------|---------|--------------------|----------|----------|----------|-------------|----------|-------------|---------|
|          |         |                    | Underlay | Pod      | Pod IP   | Overlay     | Pod      |             |         |
| Underlay | Overlay | u2oInterconnection | true     | Kube-OVN |          | Underlay IP | Underlay | ovn-cluster |         |
| Kube-OVN |         | Underlay           | Overlay  |          |          |             |          |             |         |

### ⚠ Warning

Vlan Underlay Underlay u2o

### IP

subnet IP Underlay Subnet u2oInterconnectionIP

**Underlay Subnet      VPC**

|                 |     |                |     |                    |      |                 |     |
|-----------------|-----|----------------|-----|--------------------|------|-----------------|-----|
| Underlay Subnet | VPC | Overlay Subnet | VPC | u2oInterconnection | true | subnet.spec.vpc | VPC |
|-----------------|-----|----------------|-----|--------------------|------|-----------------|-----|

**2.3.9**

|    |         |        |         |          |                |    |      |
|----|---------|--------|---------|----------|----------------|----|------|
| IP | Netplan | Ubuntu | Netplan | renderer | NetworkManager | IP | DHCP |
|----|---------|--------|---------|----------|----------------|----|------|

```
network:
  renderer: NetworkManager
  ethernets:
    eth0:
      dhcp4: no
      addresses:
        - 172.16.143.129/24
  version: 2
```

|    |         |
|----|---------|
| IP | netplan |
|----|---------|

```
netplan generate

nmcli connection reload netplan-eth0
nmcli device set eth0 managed yes
```

|          |    |     |
|----------|----|-----|
| Kube-OVN | IP | OVS |
|----------|----|-----|

|                |        |
|----------------|--------|
| NetworkManager | CentOS |
|----------------|--------|

```
nmcli connection reload eth0
nmcli device set eth0 managed yes
nmcli -t -f GENERAL.STATE device show eth0 | grep -qw unmanaged || nmcli device reapply eth0
```

|    |     |
|----|-----|
| IP | MAC |
|----|-----|

**2.3.10****hairpin Pod**

|         |     |          |     |     |
|---------|-----|----------|-----|-----|
| hairpin | Pod | Pod      | OVS | MAC |
| hairpin |     | Kube-OVN |     |     |

**Pod      Pod**

|     |     |     |     |          |
|-----|-----|-----|-----|----------|
| Pod | 300 | ARP | OVS | resubmit |
|-----|-----|-----|-----|----------|

```
2022-11-13T08:43:46.782Z|00222|ofproto_dpif_upcall(handler5)|WARN|Flow: arp,in_port=331,vlan_tci=0x0000,d1_src=00:00:25:eb:39,d1_dst=ff:ff:ff:ff:ff,arp_spa=10.213.131.240,arp_tpa=10.213.159.254,arp_op=1,arp_sha=00:00:00:25:eb:39,arp_tha=ff:ff:ff:ff:ff:ff

bridge("br-int")
-----
0. No match.
    >>> received packet on unknown port 331 <<<
    drop

Final flow: unchanged
Megaflow: recirc_id=0,eth,arp,in_port=331,d1_src=00:00:25:eb:39
Datapath actions: drop
2022-11-13T08:44:34.077Z|00224|ofproto_dpif_xlate(handler5)|WARN|over 4096 resubmit actions on bridge br-int while processing
arp,in_port=13483,vlan_tci=0x0000,d1_src=00:00:25:eb:39:
13,d1_dst=ff:ff:ff:ff:ff,arp_spa=10.213.152.3,arp_tpa=10.213.159.254,arp_op=1,arp_sha=00:00:00:25:eb:39,arp_tha=ff:ff:ff:ff:ff:ff
```

|        |                     |       |
|--------|---------------------|-------|
| OVN NB | bcast_arp_req_flood | false |
|--------|---------------------|-------|

```
kubectl ko nbctl set NB_Global . options:bcast_arp_req_flood=false
```



PDF



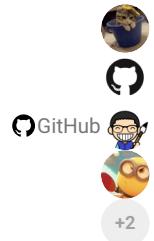
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Support

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2.3.11

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## 2.4 CNI

---

Kube-OVN    CNI    CNI    Cilium    Calico    Flannel

### 2.4.1

CNI    Kube-OVN    CNI    Pod    CNI    eth0

- CNI    Kube-OVN    VPC
- 
- Pod
- Kube-OVN    VPC NAT

### 2.4.2

1. CNI    Kubernetes    CNI    Cilium    Calico    Flannel

2. **Multus CNI**

3. **Kube-OVN**

1.    CNI

2.    Multus CNI

3.    Kube-OVN

### 2.4.3

#### Helm Chart v2

```
# values.yaml
cni:
  nonPrimaryCNI: true
```

Helm

```
helm install kube-ovn ./charts/kube-ovn-v2 \
--namespace kube-system \
--set cni.nonPrimaryCNI=true
```

#### Helm Chart v1

```
# values.yaml
cni_conf:
  NON_PRIMARY_CNI: true
```

Helm

```
helm install kube-ovn ./charts/kube-ovn \
--namespace kube-system \
--set cni_conf.NON_PRIMARY_CNI=true
```

kube-ovn-controller deployment

```
containers:
- name: kube-ovn-controller
  args:
    - --non-primary-cni-mode=true
```

## 2.4.4

### NADs

#### NAD

```
apiVersion: k8s.cni.cncf.io/v1
kind: NetworkAttachmentDefinition
metadata:
  name: kube-ovn-vpc-network
  namespace: default
spec:
  config: |
    {
      "cniVersion": "0.3.1",
      "type": "kube-ovn",
      "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
      "provider": "kube-ovn-vpc-network.default.ovn"
    }
```

#### VPC

##### VPC

```
apiVersion: kubeovn.io/v1
kind: Vpc
metadata:
  name: vpc-secondary
spec:
  namespaces:
    - default
---
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: subnet-secondary
spec:
  vpc: vpc-secondary
  cidr: "10.100.0.0/16"
  gateway: "10.100.0.1"
  provider: kube-ovn-vpc-network.default.ovn
```

#### Pod

##### Pod

```
apiVersion: v1
kind: Pod
metadata:
  name: multi-network-pod
  annotations:
    k8s.v1.cni.cncf.io/networks: default/kube-ovn-vpc-network
spec:
  containers:
    - name: app
      image: nginx
```

## 2.4.5

### eth0

- CNI Cilium Calico
- Kubernetes

**net1 net2...**

- Kube-OVN
- 
- VPC
- Kube-OVN      QoS    NAT

## 2.4.6

1.

```
#   Pod
apiVersion: v1
kind: Pod
metadata:
  name: frontend
  annotations:
    k8s.v1.cni.cncf.io/networks: |
      [
        {"name": "default/public-network"},
        {"name": "default/internal-network"}
      ]
```

2.

```
#   A Pod
apiVersion: v1
kind: Pod
metadata:
  name: tenant-a-app
  annotations:
    k8s.v1.cni.cncf.io/networks: default/tenant-a-network

---
#   B Pod
apiVersion: v1
kind: Pod
metadata:
  name: tenant-b-app
  annotations:
    k8s.v1.cni.cncf.io/networks: default/tenant-b-network
```

## 3. VPC NAT

```
apiVersion: kubeovn.io/v1
kind: VpcNatGateway
metadata:
  name: vpc-nat-gw
spec:
  vpc: vpc-secondary
  subnet: subnet-secondary
  lanIp: "10.100.0.254"
```

## 2.4.7

Pod

```
metadata:
  annotations:
    k8s.v1.cni.cncf.io/networks: |
      [
        {"name": "default/kube-ovn-network-1", "interface": "net1"},
        {"name": "default/kube-ovn-network-2", "interface": "net2"}
      ]
```

**IP**

IP

```
# IP
metadata:
  annotations:
    k8s.v1.cni.cncf.io/networks: |
      [{
        "name": "default/kube-ovn-network",
        "ips": ["10.100.0.100/16"]
      }]
```

**QoS**

QoS

```
metadata:
  annotations:
    ovn.kubernetes.io/ingress_rate: "1000"
    ovn.kubernetes.io/egress_rate: "1000"
```

---

2.4.8

1. **Pod** - NAD - kube-ovn-cni - Multus
2. - VPC - Pod -
3. **IP** - CIDR - IP - IPAM

```
# Pod
kubectl get pod <pod-name> -o yaml | grep -A 10 "networks-status"

# Pod
kubectl exec <pod-name> -- ip addr show

#
kubectl exec <pod-name> -- ip route show

# kube-ovn-cni
kubectl logs -n kube-system daemonset/kube-ovn-cni
```

---

2.4.9

1. Kubernetes
- 2.
3. **DNS** Pod DNS

---

2.4.10

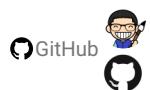
1. IP
- 2.
- 3.
- 4.
- 5.

---

2.4.11

- Multus CNI

- Kube-OVN

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---

## 2.5 Talos

Talos Linux    Kubernetes    Linux

### 2.5.1 Helm Chart    Kube-OVN

Talos Linux    Kube-OVN

```
helm install kube-ovn kubeovn/kube-ovn --wait \
-n kube-system \
--version v1.15.0 \
--set OVN_DIR=/var/lib/ovn \
--set OPENVSWITCH_DIR=/var/lib/openvswitch \
--set DISABLE_MODULES_MANAGEMENT=true \
--set cni_conf.MOUNT_LOCAL_BIN_DIR=false
```

Underlay    Helm    Chart

```
helm install kubeovn kubeovn/kube-ovn --wait \
-n kube-system \
--version v1.15.0 \
--set OVN_DIR=/var/lib/ovn \
--set OPENVSWITCH_DIR=/var/lib/openvswitch \
--set DISABLE_MODULES_MANAGEMENT=true \
--set cni_conf.MOUNT_LOCAL_BIN_DIR=false \
--set networking.NETWORK_TYPE=vlan \
--set networking.vlan.VLAN_INTERFACE_NAME=enp0s5f1 \
--set networking.vlan.VLAN_ID=0 \
--set networking.NET_STACK=ipv4 \
--set-json networking.EXCLUDE_IPS='["172.99.99.11..172.99.99.99"]' \
--set-json ipv4.POD_CIDR='["172.99.99.8/24"]' \
--set-json ipv4.POD_GATEWAY='["172.99.99.1"]'
```



#### Note

VLAN Bond Bridge    Underlay    Underlay    Talos    ignore=true

```
machine:
  network:
    interfaces:
      - interface: enp0s5f1
        ignore: true
```

PDF

Slack

Support

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GitHub



### 2.5.2

## 2.6

---

Kube-OVN

pre-v0.0.1

Kube-OVN

### 2.6.1

---

- [Linkerd](#)
- [Elasticsearch](#)
- [EMQX](#)
- [KubeSphere](#)

### 2.6.2 OpenVswitch/OVN

---

Kube-OVN

OpenVswitch OVN

- [OVN](#)
- [OpenVswitch](#)

ovn-architecture

### 2.6.3 Kube-OVN

---

Kube-OVN

Kube-OVN      kubectl      bash

Kube-OVN

### 2.6.4

---

Kube-OVN

Kube-OVN

Kube-OVN E2E

### 2.6.5

---

Kube-OVN

[OpenTelemetry](#)[DeepFlow](#)

### 2.6.6

---

Kube-OVN

7\*24

Github Issue

Github Issue

AI

AI

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[!\[\]\(b6b9ef45423deffa0928d2f6f4574582\_img.jpg\) Slack](#)
[!\[\]\(ab904d6e5b08e016f9a7765cd1d14cca\_img.jpg\) Support](#)

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2.6.7

---

## 2.7

Kube-OVN

Kube-OVN

OVS

issue

Kube-OVN

### 2.7.1 Kubernetes

[Script Uninstall](#)    [Helm Uninstall](#)

```
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/release-1.15/dist/images/cleanup.sh
bash cleanup.sh

helm uninstall kube-ovn -n kube-system
```

### 2.7.2

ovsdb openvswitch

```
rm -rf /var/run/openvswitch
rm -rf /var/run/ovn
rm -rf /etc/origin/openvswitch/
rm -rf /etc/origin/ovn/
rm -rf /etc/cni/net.d/00-kube-ovn.conflist
rm -rf /etc/cni/net.d/01-kube-ovn.conflist
rm -rf /var/log/openvswitch
rm -rf /var/log/ovn
rm -fr /var/log/kube-ovn
```

### 2.7.3

iptables/ipset

reboot

[PDF](#)

[Slack](#)

[Support](#)

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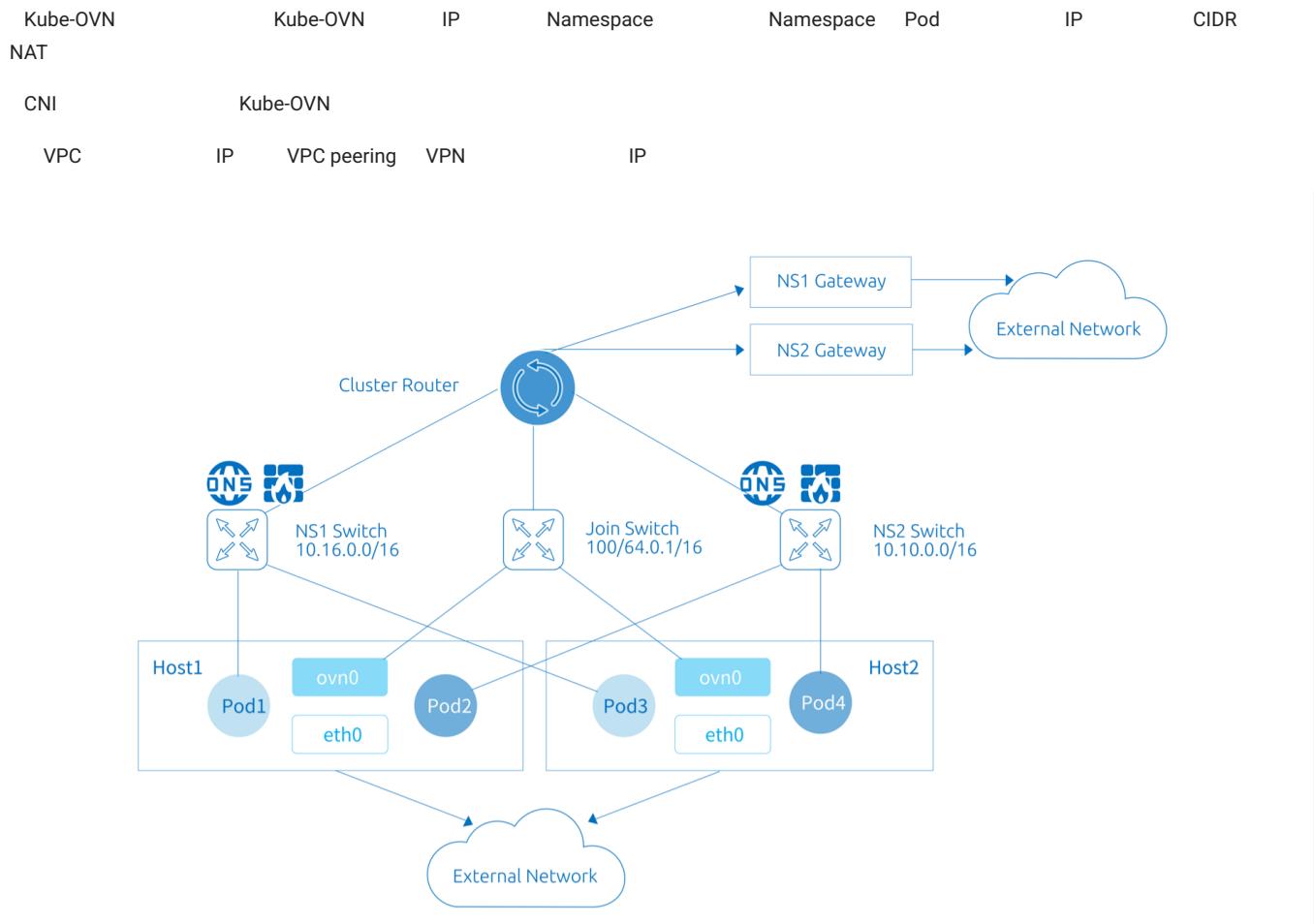
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### 2.7.4

## 3.

## 3.1



Overlay Underlay

## 3.1.1

| Kube-OVN | Namespace | IP      | CIDR |
|----------|-----------|---------|------|
| Overlay  | NAT       | Flannel |      |
| Underlay | arping    |         |      |

spec default true ovn-default

```
# kubectl get subnet ovn-default -o yaml
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  creationTimestamp: "2019-08-06T09:33:43Z"
  generation: 1
  name: ovn-default
  resourceVersion: "1571334"
```

```

selfLink: /apis/kubeovn.io/v1/subnets/ovn-default
uid: 7e2451f8-fb44-4f7f-b3e0-cfd27f6fd5d6
spec:
  cidrBlock: 10.16.0.0/16
  default: true
  excludeIps:
  - 10.16.0.1
  gateway: 10.16.0.1
  gatewayType: distributed
  natOutgoing: true
  private: false
  protocol: IPv4

```

### 3.1.2 Join

|                |       |      |         |          |      |      |      |      |
|----------------|-------|------|---------|----------|------|------|------|------|
| Kubernetes Pod | Node  | Pod  | Overlay | Kube-OVN | join | Node | ovn0 | join |
| Pods           | Nodes | ovn0 | Node    | Pod      | ovn0 |      | ovn0 |      |
|                |       |      | join    | CIDR     |      | Join |      |      |

#### Join

|     |          |                              |          |         |
|-----|----------|------------------------------|----------|---------|
| Pod | hostport | externalTrafficPolicy: Local | NodePort | Service |
|-----|----------|------------------------------|----------|---------|

|      |      |
|------|------|
| join | CIDR |
|------|------|

```

# kubectl get subnet join -o yaml
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  creationTimestamp: "2019-08-06T09:33:43Z"
  generation: 1
  name: join
  resourceVersion: "1571333"
  selfLink: /apis/kubeovn.io/v1/subnets/join
  uid: 9c744810-c678-4d50-8a7d-b8ec12ef91b8
spec:
  cidrBlock: 100.64.0.0/16
  default: false
  excludeIps:
  - 100.64.0.1
  gateway: 100.64.0.1
  gatewayNode: ""
  gatewayType: ""
  natOutgoing: false
  private: false
  protocol: IPv4

```

Node ovn0

```

# ifconfig ovn0
ovn0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1420
    inet 100.64.0.4 netmask 255.255.0.0 broadcast 100.64.255.255
      inet6 fe80::800:ff:fe40:5 prefixlen 64 scopeid 0x20<link>
        ether 0a:00:00:40:00:05 txqueuelen 1000  (Ethernet)
          RX packets 18 bytes 1428 (1.3 KiB)
          RX errors 0 dropped 0 overruns 0 frame 0
          TX packets 19 bytes 1810 (1.7 KiB)
          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

```

### 3.1.3

#### Namespace

```

cat <<EOF | kubectl create -f -
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: subnet1
spec:
  protocol: IPv4
  cidrBlock: 10.66.0.0/16
  excludeIps:

```

```

- 10.66.0.1..10.66.0.10
- 10.66.0.101..10.66.0.151
gateway: 10.66.0.1
gatewayType: distributed
natOutgoing: true
routeTable: ""
namespaces:
- ns1
- ns2
EOF

```

- cidrBlock : CIDR      VPC      Subnet CIDR
- excludeIps :              IP      Underlay
- gateway :      Overlay      Kube-OVN      Underlay
- namespaces :      Namespace      Namespace      Pod
- routeTable :

```

# kubectl create ns ns1
namespace/ns1 created

# kubectl run nginx --image=docker.io/library/nginx:alpine -n ns1
deployment.apps/nginx created

# kubectl get pod -n ns1 -o wide
NAME           READY   STATUS    RESTARTS   AGE   IP          NODE   NOMINATED NODE   READINESS GATES
nginx-74d5899f46-n8wtg  1/1     Running   0          10s   10.66.0.11  node1  <none>        <none>

```

## Workload

| Pod | Namespace | IP | Namespace | Workload | Pod | Annotation ovn.kubernetes.io/logical_switch |
|-----|-----------|----|-----------|----------|-----|---|
|-----|-----------|----|-----------|----------|-----|---|

```

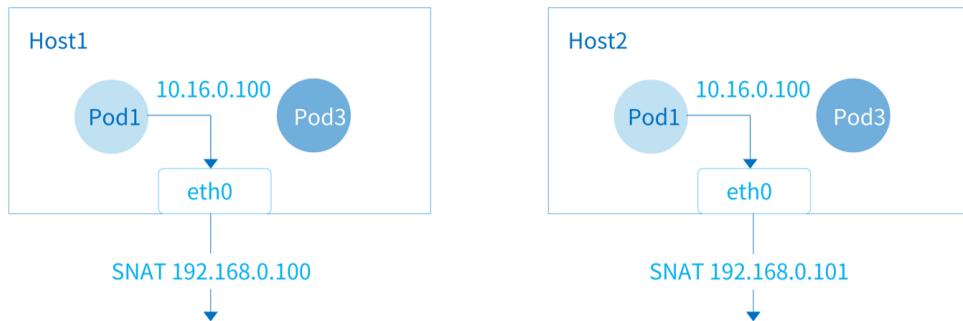
apiVersion: v1
kind: Pod
metadata:
  name: another-subnet
  annotations:
    ovn.kubernetes.io/logical_switch: subnet1
spec:
  containers:
  - name: another-subnet
    image: docker.io/library/nginx:alpine

```

| Workload                           | Deployment | StatefulSet | ovn.kubernetes.io/logical_switch Annotation |
|------------------------------------|------------|-------------|---|
| spec.template.metadata.annotations |            |             |   |

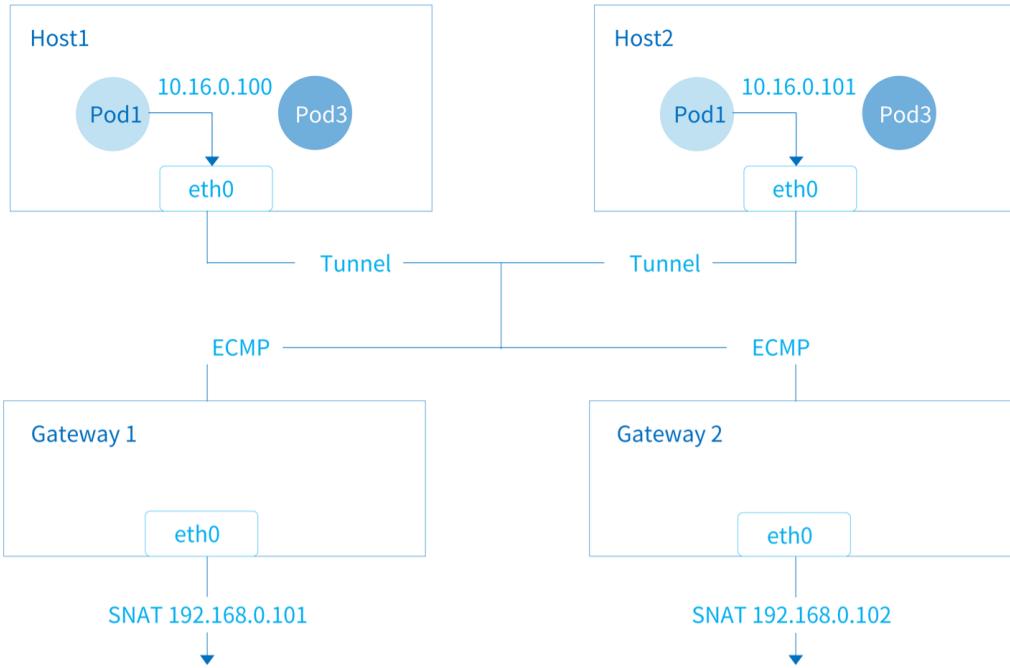
## 3.1.4 Overlay





```
gatewayType      distributed
```

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: distributed
spec:
  protocol: IPv4
  cidrBlock: 10.166.0.0/16
  default: false
  excludeIps:
  - 10.166.0.1
  gateway: 10.166.0.1
  gatewayType: distributed
  natOutgoing: true
```



| Pod | IP          | Pod         | ovn0        | natOutgoing | true |
|-----|-------------|-------------|-------------|-------------|------|
|     | IP          | Kubernetes  | NodeName    | gatewayNode |      |
|     | gatewayType | centralized | gatewayNode |             |      |

```

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: centralized
spec:
  protocol: IPv4
  cidrBlock: 10.166.0.0/16
  default: false
  excludeIps:
  - 10.166.0.1
  gateway: 10.166.0.1
  gatewayType: centralized
  gatewayNode: "node1,node2"
  natOutgoing: true

```

- gatewayNode kube-ovn-worker:172.18.0.2, kube-ovn-control-plane:172.18.0.3
- ECMP ECMP
- Kube-OVN v1.12.0 subnet crd spec enableEcmp ECMP ECMP kube-ovn- controller Deployment enable-ecmp v1.12.0

|            |      |                     |      |    |        |
|------------|------|---------------------|------|----|--------|
|            | ECMP | kube-ovn-controller | ping | 5s | 5s-10s |
| Node Ready |      |                     |      |    |        |

gatewayNodeSelectors

### gatewayNodeSelectors

- gatewayNode  gatewayNode gatewayNodeSelectors
- OR
- 

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: centralized-selector
spec:
  protocol: IPv4
  cidrBlock: 10.166.0.0/16
  default: false
  excludeIps:
  - 10.166.0.1
  gateway: 10.166.0.1
  gatewayType: centralized
  gatewayNodeSelectors:
  - matchLabels:
    role: gateway
  - matchExpressions:
    - key: node-type
      operator: In
      values: ["gateway", "egress"]
  natOutgoing: true
```

## 3.1.5 ACL

### Warning

Kube-OVN [NetworkPolicy](#) [Network Policy API](#) Subnet ACL [Security Group](#) OVN ACL [NetworkPolicy](#) [NetworkPolicy API](#)

ACL      Kube-OVN    Subnet    ACL

Subnet    ACL    OVN    ACL                         ovn-nb ACL Table    match                         ovn-sb Logical Flow Table

IP    10.10.0.2    Pod                                 ACL

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: acl
spec:
  allowEWTraffic: false
  acls:
  - action: drop
    direction: to-lport
    match: ip4.dst == 10.10.0.2 && ip
    priority: 1002
  - action: allow-related
    direction: from-lport
    match: ip4.src == 10.10.0.2 && ip
    priority: 1002
  cidrBlock: 10.10.0.0/24
```

ACL     allowEWTraffic: true

## 3.1.6

ACL     ACL

Kube-OVN     Pod

CRD    private    true                                 allowSubnets    allowSubnets

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: private
spec:
  protocol: IPv4
  default: false
  namespaces:
    - ns1
    - ns2
  cidrBlock: 10.69.0.0/16
  private: true
  allowSubnets:
    - 10.16.0.0/16
    - 10.18.0.0/16
```

### 3.1.7 Underlay

#### Underlay

|                   |          |        |         |          |          |         |
|-------------------|----------|--------|---------|----------|----------|---------|
| • vlan:           | Underlay | Subnet | Vlan CR | Underlay |          |         |
| • logicalGateway: | Underlay |        |         | OVN      | Underlay | Overlay |

### 3.1.8

|              |     |      |     |          |      |
|--------------|-----|------|-----|----------|------|
| kube-ovn-cni | Pod | ICMP | ARP | Underlay | ICMP |
|--------------|-----|------|-----|----------|------|

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: disable-gw-check
spec:
  disableGatewayCheck: true
```

### 3.1.9 Multicast-Snoop

|        |     |     |     |        |                 |     |                |                 |
|--------|-----|-----|-----|--------|-----------------|-----|----------------|-----------------|
| subnet | Pod | OVN | Pod | subnet | multicast snoop | OVN | South Database | Multicast_Group |
|--------|-----|-----|-----|--------|-----------------|-----|----------------|-----------------|

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: sample1
spec:
  enableMulticastSnooop: true
```

### 3.1.10 Subnet MTU

|        |     |     |        |     |
|--------|-----|-----|--------|-----|
| Subnet | Pod | MTU | Subnet | Pod |
|--------|-----|-----|--------|-----|

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: sample1
spec:
  mtu: 1300
```

### 3.1.11

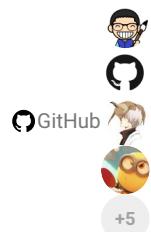
- IP
- VPC NAT
- QoS
- 
- DHCP
- 
-

- IP



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3.1.12

---

## 3.2

Kube-OVN      Pod      Namespace      IP      Mac      Kube-OVN

- Pod IP/Mac
- Workload IP Pool
- StatefulSet
- KubeVirt VM
- Multus

### 3.2.1 Pod IP Mac

Pod annotation Pod IP/Mac, kube-ovn-controller

```
apiVersion: v1
kind: Pod
metadata:
  name: static-ip
  annotations:
    ovn.kubernetes.io/ip_address: 10.16.0.15 // 10.16.0.15,fd00:10:16::15
    ovn.kubernetes.io/mac_address: 00:00:00:53:6B:B6
spec:
  containers:
  - name: static-ip
    image: docker.io/library/nginx:alpine
```

annotation      Pod IP/Mac

1. IP/Mac      IP/Mac
2. IP      CIDR
3. IP      Mac

### 3.2.2 Workload IP Pool

Kube-OVN      annotation ovn.kubernetes.io/ip\_pool      Workload Deployment/StatefulSet/DaemonSet/Job/CronJob      IP      kube-ovn-  
controller      ovn.kubernetes.io/ip\_pool      IP  
IP Pool      Annotation      template      annotation      Kubernetes      Workload      Workload

#### Deployment IP

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: ippool
  labels:
    app: ippool
spec:
  replicas: 2
  selector:
    matchLabels:
      app: ippool
  template:
    metadata:
      labels:
        app: ippool
      annotations:
        ovn.kubernetes.io/ip_pool: 10.16.0.15,10.16.0.16,10.16.0.17 // 10.16.0.15,fd00:10:16::000E;10.16.0.16,fd00:10:16::000F;
        10.16.0.17,fd00:10:16::0010
    spec:
      containers:
      - name: ippool
        image: docker.io/library/nginx:alpine
```

| Workload                     | IP |          |      |     |  |          |  |                           |    |
|------------------------------|----|----------|------|-----|--|----------|--|---------------------------|----|
| 1. ovn.kubernetes.io/ip_pool | IP |          | CIDR |     |  |          |  |                           |    |
| 2. ovn.kubernetes.io/ip_pool | IP |          | IP   |     |  |          |  |                           |    |
| 3. ovn.kubernetes.io/ip_pool | IP | replicas |      | Pod |  | Workload |  | ovn.kubernetes.io/ip_pool | IP |

### 3.2.3 StatefulSet

| StatefulSet        | IP                        | Workload            | ovn.kubernetes.io/ip_pool | Pod | IP        |                           |             |       |                    |
|--------------------|---------------------------|---------------------|---------------------------|-----|-----------|---------------------------|-------------|-------|--------------------|
| StatefulSet        |                           |                     | Kube-OVN                  |     |           |                           |             |       |                    |
| 1. Pod             | ovn.kubernetes.io/ip_pool | IP                  | StatefulSet               | web | web-0     | ovn.kubernetes.io/ip_pool | IP          | web-1 | IP                 |
| 2. StatefulSet Pod | OVN                       | logical_switch_port |                           | Pod | interface | Pod                       | IP/Mac      |       | StatefulSet Volume |
| 3. 2               | ovn.kubernetes.io/ip_pool | StatefulSet Pod     |                           |     | IP/Mac    |                           | StatefulSet |       |                    |

#### StatefulSet

```
apiVersion: apps/v1
kind: StatefulSet
metadata:
  name: web
spec:
  serviceName: "nginx"
  replicas: 2
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
        - name: nginx
          image: docker.io/library/nginx:alpine
          ports:
            - containerPort: 80
              name: web
```

StatefulSet Pod Pod IP

#### StatefulSet Pod IP

| StatefulSet        | IP | Pod Name    | Statefulset | ovn.kubernetes.io/ip_pool | Annotation | Pod         | IP |
|--------------------|----|-------------|-------------|---------------------------|------------|-------------|----|
| StatefulSet Pod IP |    | StatefulSet | scale       | 0                         | Annotation | StatefulSet |    |

### 3.2.4 KubeVirt VM

| KubeVirt | VM | kube-ovn-controller | StatefulSet Pod | IP | VM |
|----------|----|---------------------|-----------------|----|----|
| VM       | IP |                     |                 |    |    |

### 3.2.5 Multus

| Multus | Pod | Kube-OVN | annotation | Kube-OVN | CNI | Kube-OVN | IPAM | CNI |
|--------|-----|----------|------------|----------|-----|----------|------|-----|
|        |     |          |            |          |     |          |      |     |



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3.2.6

---

## 3.3 IP

IP IPPool Subnet IPAM IP Namespace

### 3.3.1

```
apiVersion: kubeovn.io/v1
kind: IPPool
metadata:
  name: pool-1
spec:
  subnet: ovn-default
  ips:
    - "10.16.0.201"
    - "10.16.0.210/30"
    - "10.16.0.220..10.16.0.230"
  namespaces:
    - ns=1
  enableAddressSet: true
```



### 3.3.2

1. Workload IP Pool IP IP
2. IP .spec.ips IP IP .spec.ips CIDR
3. IP IP
4. IP .spec.ips
5. IP IP IP IP IP IP
6. IP IP
7. IP Namespace
8. IP .spec.enableAddressSet false true IP OVN NB AddressSet IP IP AddressSet  
NetworkPolicy VPC AddressSet

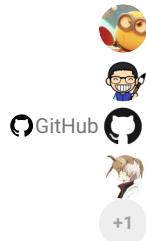
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3.3.3

---

## 3.4

### Pod Annotations

```
apiVersion: v1
kind: Pod
metadata:
  name: custom-routes
  annotations:
    ovn.kubernetes.io/routes: |
      [{ "dst": "192.168.0.101/24", "gw": "10.16.0.254" },
       { "gw": "10.16.0.254" }]
spec:
  containers:
  - name: nginx
    image: docker.io/library/nginx:alpine
```

dst

| Deployment | DaemonSet | StatefulSet | Annotation | .spec.template.metadata.annotations |
|------------|-----------|-------------|------------|-------------------------------------|
|------------|-----------|-------------|------------|-------------------------------------|

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: custom-routes
  labels:
    app: nginx
spec:
  replicas: 2
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
      annotations:
        ovn.kubernetes.io/routes: |
          [{ "dst": "192.168.0.101/24", "gw": "10.16.0.254" },
           { "gw": "10.16.0.254" }]
    spec:
      containers:
      - name: nginx
        image: docker.io/library/nginx:alpine
```

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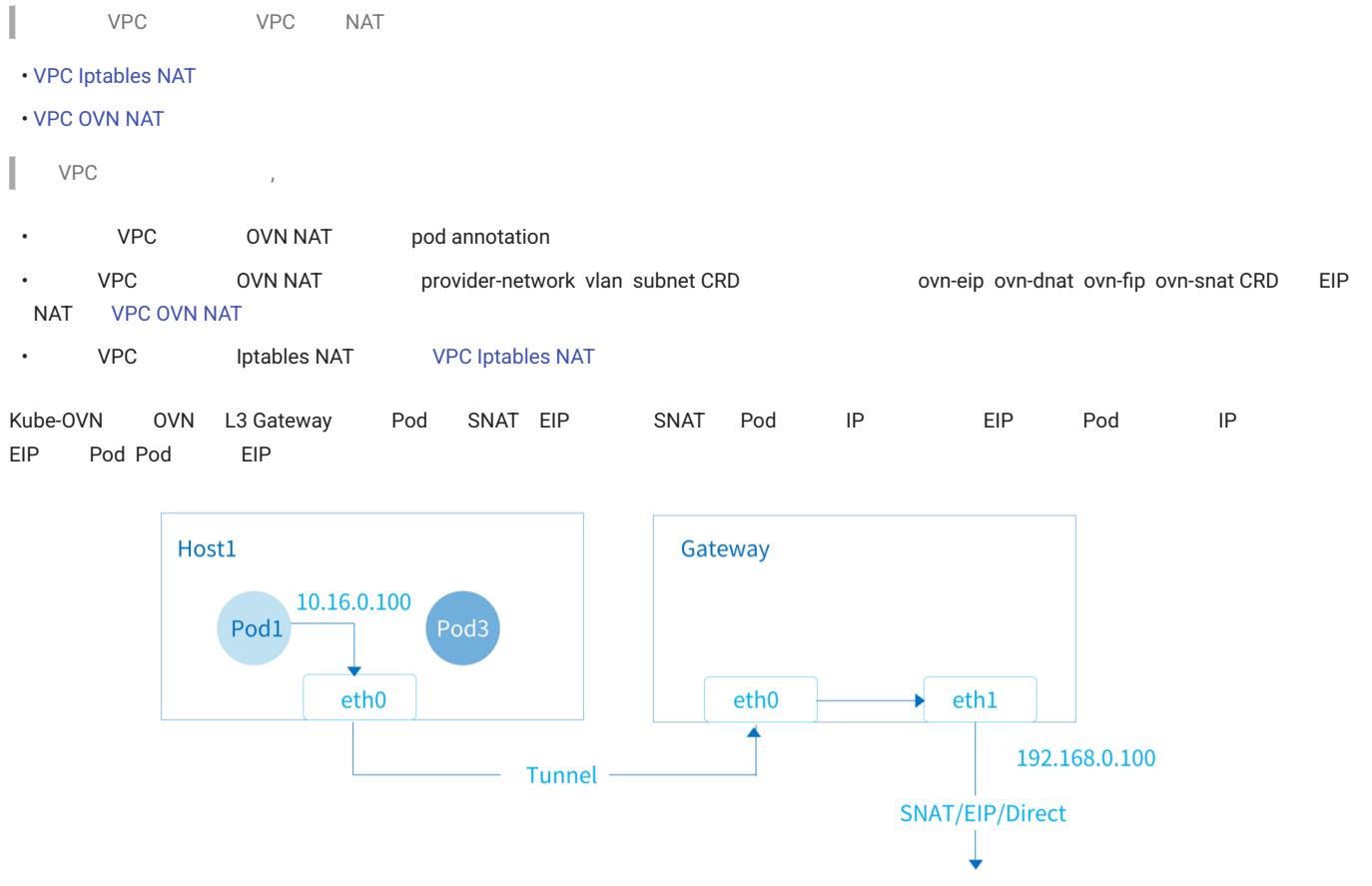
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### 3.4.1

### 3.5 EIP SNAT



#### 3.5.1

- OVN L3 Gateway      OVS      Overlay      Underlay
- NAT      Underlay
- EIP      SNAT

#### 3.5.2

kube-system ConfigMap ovn-external-gw-config

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: ovn-external-gw-config
  namespace: kube-system
data:
  enable-external-gw: "true"
  external-gw-nodes: "kube-ovn-worker"
  external-gw-nic: "eth1"
  external-gw-addr: "172.56.0.1/16"
```

```

nic-ip: "172.56.0.254/16"
nic-mac: "16:52:f3:13:6a:25"

• enable-external-gw: SNAT EIP
• type: centralized distributed centralized distributed
• external-gw-nodes: centralized
• external-gw-nic:
• external-gw-addr: IP
• nic-ip, nic-mac: IP Mac IP Mac

```

### 3.5.3 OVN OVS

|        |              |                          |         |
|--------|--------------|--------------------------|---------|
| OVN-NB | ovn-external | ovn-cluster-ovn-external | chassis |
|--------|--------------|--------------------------|---------|

```

# kubectl get nbctl show
switch 3de4cead7-1a71-43f3-8b62-435a57ef16a6 (external)
  port localnet.external
    type: localnet
    addresses: ["unknown"]
  port external-ovn-cluster
    type: router
    router-port: ovn-cluster-external
router e1eb83ad-34be-4ed5-9a02-fcc8b1d357c4 (ovn-cluster)
  port ovn-cluster-external
    mac: "ac:1f:6b:2d:33:f1"
    networks: ["172.56.0.100/16"]
  gateway chassis: [a5682814-2e2c-46dd-9c1c-6803ef0dab66]

```

|     |             |
|-----|-------------|
| OVS | br-external |
|-----|-------------|

```

# kubectl get vsctl ${gateway node name} show
e7d81150-7743-4d6e-9e6f-5c688232e130
  Bridge br-external
    Port br-external
      Interface br-external
        type: internal
    Port eth1
      Interface eth1
      Port patch-localnet.external-to-br-int
        Interface patch-localnet.external-to-br-int
          type: patch
          options: {peer=patch-br-int-to-localnet.external}

```

### 3.5.4 Pod EIP SNAT

|     |                        |                                  |          |
|-----|------------------------|----------------------------------|----------|
| Pod | ovn.kubernetes.io/snat | ovn.kubernetes.io/eip annotation | SNAT EIP |
|-----|------------------------|----------------------------------|----------|

```

apiVersion: v1
kind: Pod
metadata:
  name: pod-snat
  annotations:
    ovn.kubernetes.io/snat: 172.56.0.200
spec:
  containers:
    - name: pod-snat
      image: docker.io/library/nginx:alpine
---
apiVersion: v1
kind: Pod
metadata:
  name: pod-eip
  annotations:
    ovn.kubernetes.io/eip: 172.56.0.233
spec:
  containers:
    - name: pod-eip
      image: docker.io/library/nginx:alpine

```

|         |     |          |                                     |
|---------|-----|----------|-------------------------------------|
| kubectl | Pod | EIP SNAT | ovn.kubernetes.io/routed annotation |
|---------|-----|----------|-------------------------------------|

```

kubectl annotate pod pod-gw ovn.kubernetes.io/eip=172.56.0.221 --overwrite
kubectl annotate pod pod-gw ovn.kubernetes.io/routed-

```

|          |                                     |
|----------|-------------------------------------|
| EIP SNAT | ovn.kubernetes.io/routed annotation |
|----------|-------------------------------------|

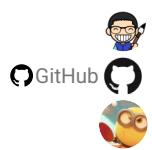
### 3.5.5

```
kube-ovn-controller      SNAT   EIP  
• --external-gateway-config-ns: Configmap ovn-external-gw-config  Namespace  kube-system  
• --external-gateway-net:           external  
• --external-gateway-vlanid:     Vlan Tag    0    Vlan
```

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### 3.5.6

## 3.6 QoS



### 3.6.1 QoS

QoS      Pod annotation      Pod      Mbit/s

```

apiVersion: v1
kind: Pod
metadata:
  name: qos
  namespace: ls1
  annotations:
    ovn.kubernetes.io/ingress_rate: "3"
    ovn.kubernetes.io/egress_rate: "1"
spec:
  containers:
  - name: qos
    image: docker.io/library/nginx:alpine
  
```

annotation      QoS

```
kubectl annotate --overwrite pod nginx-74d5899f46-d7qkn ovn.kubernetes.io/ingress_rate=3
```

#### QoS

```

kind: DaemonSet
apiVersion: apps/v1
metadata:
  name: perf
  namespace: ls1
  labels:
    app: perf
spec:
  selector:
    matchLabels:
      app: perf
  template:
    metadata:
      labels:
        app: perf
    spec:
      containers:
      - name: nginx
        image: docker.io/kubeovn/perf
  
```

Pod      iperf3 server

```
# kubectl exec -it perf-4n4gt -n ls1 sh
# iperf3 -s
-----
Server listening on 5201
-----
```

Pod      Pod

```

# kubectl exec -it perf-d4mqc -n ls1 sh
# iperf3 -c 10.66.0.12
Connecting to host 10.66.0.12, port 5201
[  4] local 10.66.0.14 port 51544 connected to 10.66.0.12 port 5201
[ ID] Interval           Transfer     Bandwidth   Retr  Cwnd
[  4]  0.00-1.00  sec   86.4 MBytes   725 Mbits/sec  3   350 KBytes
[  4]  1.00-2.00  sec   89.9 MBytes   754 Mbits/sec 118  473 KBytes
[  4]  2.00-3.00  sec   101 MBytes   848 Mbits/sec 184  586 KBytes
[  4]  3.00-4.00  sec   104 MBytes   875 Mbits/sec 217  671 KBytes
[  4]  4.00-5.00  sec   111 MBytes   935 Mbits/sec 175  772 KBytes
  
```

```
[ 4] 5.00-6.00 sec 100 MBytes 840 Mbits/sec 658 598 KBytes
[ 4] 6.00-7.00 sec 106 MBytes 890 Mbits/sec 742 668 KBytes
[ 4] 7.00-8.00 sec 102 MBytes 857 Mbits/sec 764 724 KBytes
[ 4] 8.00-9.00 sec 97.4 MBytes 817 Mbits/sec 1175 764 KBytes
[ 4] 9.00-10.00 sec 111 MBytes 934 Mbits/sec 1083 838 KBytes
-----
[ ID] Interval Transfer Bandwidth Retr
[ 4] 0.00-10.00 sec 1010 MBytes 848 Mbits/sec 5119 sender
[ 4] 0.00-10.00 sec 1008 MBytes 846 Mbits/sec receiver
iperf Done.
```

### Pod QoS

```
kubectl annotate --overwrite pod perf-4n4gt -n ls1 ovn.kubernetes.io/ingress_rate=30
```

### Pod Pod

```
# iperf3 -c 10.66.0.12
Connecting to host 10.66.0.12, port 5201
[ 4] local 10.66.0.14 port 52372 connected to 10.66.0.12 port 5201
[ ID] Interval Transfer Bandwidth Retr Cwnd
[ 4] 0.00-1.00 sec 3.66 MBytes 30.7 Mbits/sec 2 76.1 KBytes
[ 4] 1.00-2.00 sec 3.43 MBytes 28.8 Mbits/sec 0 104 KBytes
[ 4] 2.00-3.00 sec 3.50 MBytes 29.4 Mbits/sec 0 126 KBytes
[ 4] 3.00-4.00 sec 3.50 MBytes 29.3 Mbits/sec 0 144 KBytes
[ 4] 4.00-5.00 sec 3.43 MBytes 28.8 Mbits/sec 0 160 KBytes
[ 4] 5.00-6.00 sec 3.43 MBytes 28.8 Mbits/sec 0 175 KBytes
[ 4] 6.00-7.00 sec 3.50 MBytes 29.3 Mbits/sec 0 212 KBytes
[ 4] 7.00-8.00 sec 3.68 MBytes 30.9 Mbits/sec 0 294 KBytes
[ 4] 8.00-9.00 sec 3.74 MBytes 31.4 Mbits/sec 0 398 KBytes
[ 4] 9.00-10.00 sec 3.80 MBytes 31.9 Mbits/sec 0 526 KBytes
-----
[ ID] Interval Transfer Bandwidth Retr
[ 4] 0.00-10.00 sec 35.7 MBytes 29.9 Mbits/sec 2 sender
[ 4] 0.00-10.00 sec 34.5 MBytes 29.0 Mbits/sec receiver
iperf Done.
```

## 3.6.2 linux-netem QoS

RHEL netem yum install -y kernel-modules-extra && modprobe sch\_netem

| Pod                         | annotation | linux-netem | QoS   | netem | QoS  | Pod | Ingress |
|-----------------------------|------------|-------------|-------|-------|------|-----|---------|
| • ovn.kubernetes.io/latency | Pod        |             |       | ms    |      |     |         |
| • ovn.kubernetes.io/jitter  | Pod        |             |       | ms    |      |     |         |
| • ovn.kubernetes.io/limit   |            | qdisc       |       |       | 1000 |     |         |
| • ovn.kubernetes.io/loss    |            |             | float | 20    | 20%  |     |         |

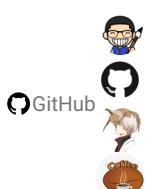
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## 3.6.3

## 3.7



### 3.7.1

CIDR    cidr=<IPv4 CIDR>, <IPv6 CIDR>    CIDR    IPv4    IPv6

```

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: ovn-test
spec:
  cidrBlock: 10.16.0.0/16,fd00:10:16::/64
  excludeIps:
  - 10.16.0.1
  - fd00:10:16::1
  gateway: 10.16.0.1,fd00:10:16::1
  
```

```

POD_CIDR="10.16.0.0/16,fd00:10:16::/64"
JOIN_CIDR="100.64.0.0/16,fd00:100:64::/64"
  
```

### 3.7.2 Pod

Pod    IPv4    IPv6    Pod annotation :

```

apiVersion: v1
kind: Pod
metadata:
  annotations:
    ovn.kubernetes.io/allocated: "true"
    ovn.kubernetes.io/cidr: 10.16.0.0/16,fd00:10:16::/64
    ovn.kubernetes.io/gateway: 10.16.0.1,fd00:10:16::1
    ovn.kubernetes.io/ip_address: 10.16.0.9,fd00:10:16::9
    ovn.kubernetes.io/logical_switch: ovn-default
    ovn.kubernetes.io/mac_address: 00:00:00:14:88:09
    ovn.kubernetes.io/network_types: geneve
    ovn.kubernetes.io/routed: "true"
...
  podIP: 10.16.0.9
  podIPs:
  - ip: 10.16.0.9
  - ip: fd00:10:16::9
  
```



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### 3.7.3

## 3.8 Webhook

```
Webhook   Kube-OVN   CRD           Webhook   IP   Subnet CIDR
Webhook   Subnet   Pod           Kube-OVN   Webhook   Pod
```

### 3.8.1 Cert-Manager

```
Webhook   cert-manager   Webhook   cert-manager
```

cert-manager:

```
kubectl apply -f https://github.com/cert-manager/cert-manager/releases/download/v1.8.0/cert-manager.yaml
```

```
cert-manager   cert-manager
```

### 3.8.2 Webhook

```
Webhook   yaml   :
```

```
# kubectl apply -f https://raw.githubusercontent.com/kubeovn/kube-ovn/release-1.15/yamls/webhook.yaml
deployment.apps/kube-ovn-webhook created
service/kube-ovn-webhook created
validatingwebhookconfiguration.admissionregistration.k8s.io/kube-ovn-webhook created
certificate.cert-manager.io/kube-ovn-webhook-serving-cert created
issuer.cert-manager.io/kube-ovn-webhook-selfsigned-issuer created
```

### 3.8.3 Webhook

Pod Pod IP 10.16.0.15

```
# kubectl get pod -o wide
NAME          READY   STATUS    RESTARTS   AGE     IP           NODE   NOMINATED NODE   READINESS GATES
static-7584848b74-fw9dm   1/1    Running   0        2d13h   10.16.0.15   kube-ovn-worker   <none>
```

yaml IP Pod

```
apiVersion: v1
kind: Pod
metadata:
  annotations:
    ovn.kubernetes.io/ip_address: 10.16.0.15
    ovn.kubernetes.io/mac_address: 00:00:00:53:6B:B6
  labels:
    app: static
  managedFields:
    name: staticip-pod
    namespace: default
spec:
  containers:
  - image: docker.io/library/nginx:alpine
    imagePullPolicy: IfNotPresent
    name: qatest
```

yaml Pod IP

```
# kubectl apply -f pod-static.yaml
Error from server (annotation ip address 10.16.0.15 is conflict with ip crd static-7584848b74-fw9dm.default 10.16.0.15): error when creating "pod-static.yaml": admission webhook "pod-ip-validation.kube-ovn.io" denied the request: annotation ip address 10.16.0.15 is conflict with ip crd static-7584848b74-fw9dm.default 10.16.0.15
```



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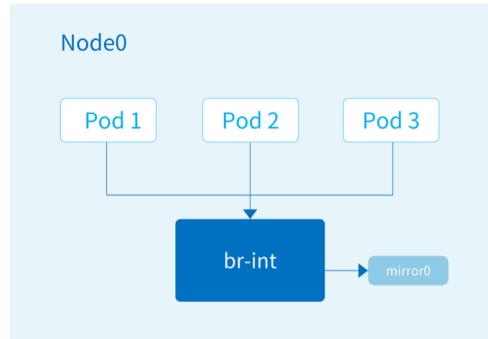
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3.8.4

---

## 3.9

NPM  
CPU            5%~10%      CPU



### 3.9.1

kube-ovn-cni DaemonSet

```

• --enable-mirror=true
• --mirror-iface=mirror0:
          br-int           Kube-OVN
          mirror0
tcpdump      mirror0

```

```
tcpdump -ni mirror0
```

### 3.9.2 Pod

Pod            Pod    ovn.kubernetes.io/mirror annotation    Pod

```

apiVersion: v1
kind: Pod
metadata:
  name: mirror-pod
  namespace: ls1
  annotations:
    ovn.kubernetes.io/mirror: "true"
spec:
  containers:
  - name: mirror-pod
    image: docker.io/library/nginx:alpine

```

### 3.9.3

---

#### 1. Pod to Pod in the same Nodes

| Size | TCP Latency | TCP Bandwidth  | UDP Latency | UDP Lost Rate | UDP Bandwidth  |
|------|-------------|----------------|-------------|---------------|----------------|
| 64   | 12.7 us     | 289 Mbits/sec  | 12.6 us     | (1.8%)        | 77.9 Mbits/sec |
| 128  | 15.5 us     | 517 Mbits/sec  | 12.7 us     | (0%)          | 155 Mbits/sec  |
| 512  | 12.2 us     | 1.64 Gbits/sec | 12.4 us     | (0%)          | 624 Mbits/sec  |
| 1k   | 13 us       | 2.96 Gbits/sec | 11.4 us     | (0.53%)       | 1.22 Gbits/sec |
| 4k   | 18 us       | 7.67 Gbits/sec | 25.7 us     | (0.41%)       | 1.50 Gbits/sec |

| Size | TCP Latency | TCP Bandwidth  | UDP Latency | UDP Lost Rate | UDP Bandwidth  |
|------|-------------|----------------|-------------|---------------|----------------|
| 64   | 11.9 us     | 324 Mbits/sec  | 12.2 us     | (0.22%)       | 102 Mbits/sec  |
| 128  | 10.5 us     | 582 Mbits/sec  | 9.5 us      | (0.21%)       | 198 Mbits/sec  |
| 512  | 11.6 us     | 1.84 Gbits/sec | 9.32 us     | (0.091%)      | 827 Mbits/sec  |
| 1k   | 10.5 us     | 3.44 Gbits/sec | 10 us       | (1.2%)        | 1.52 Gbits/sec |
| 4k   | 16.7 us     | 8.52 Gbits/sec | 18.2 us     | (1.3%)        | 2.42 Gbits/sec |

#### 2. Pod to Pod in the different Nodes

| Size | TCP Latency | TCP Bandwidth  | UDP Latency | UDP Lost Rate | UDP Bandwidth  |
|------|-------------|----------------|-------------|---------------|----------------|
| 64   | 258 us      | 143 Mbits/sec  | 237 us      | (61%)         | 28.5 Mbits/sec |
| 128  | 240 us      | 252 Mbits/sec  | 231 us      | (64%)         | 54.9 Mbits/sec |
| 512  | 236 us      | 763 Mbits/sec  | 256 us      | (68%)         | 194 Mbits/sec  |
| 1k   | 242 us      | 969 Mbits/sec  | 225 us      | (62%)         | 449 Mbits/sec  |
| 4k   | 352 us      | 1.12 Gbits/sec | 382 us      | (0.71%)       | 21.4 Mbits/sec |

| Size | TCP Latency | TCP Bandwidth  | UDP Latency | UDP Lost Rate | UDP Bandwidth  |
|------|-------------|----------------|-------------|---------------|----------------|
| 64   | 278 us      | 140 Mbits/sec  | 227 us      | (24%)         | 59.6 Mbits/sec |
| 128  | 249 us      | 265 Mbits/sec  | 265 us      | (23%)         | 114 Mbits/sec  |
| 512  | 233 us      | 914 Mbits/sec  | 235 us      | (21%)         | 468 Mbits/sec  |
| 1k   | 238 us      | 1.14 Gbits/sec | 240 us      | (15%)         | 891 Mbits/sec  |
| 4k   | 370 us      | 1.25 Gbits/sec | 361 us      | (0.43%)       | 7.54 Mbits/sec |

### 3. Node to Node

| Size | TCP Latency | TCP Bandwidth  | UDP Latency | UDP Lost Rate | UDP Bandwidth  |
|------|-------------|----------------|-------------|---------------|----------------|
| 64   | 205 us      | 162 Mbits/sec  | 183 us      | (11%)         | 74.2 Mbits/sec |
| 128  | 222 us      | 280 Mbits/sec  | 206 us      | (6.3%)        | 155 Mbits/sec  |
| 512  | 220 us      | 1.04 Gbits/sec | 177 us      | (20%)         | 503 Mbits/sec  |
| 1k   | 213 us      | 2.06 Gbits/sec | 201 us      | (8.6%)        | 1.14 Gbits/sec |
| 4k   | 280 us      | 5.01 Gbits/sec | 315 us      | (37%)         | 1.20 Gbits/sec |

| Size | TCP Latency | TCP Bandwidth  | UDP Latency | UDP Lost Rate | UDP Bandwidth  |
|------|-------------|----------------|-------------|---------------|----------------|
| 64   | 204 us      | 157 Mbits/sec  | 204 us      | (8.8%)        | 81.9 Mbits/sec |
| 128  | 213 us      | 262 Mbits/sec  | 225 us      | (19%)         | 136 Mbits/sec  |
| 512  | 220 us      | 1.02 Gbits/sec | 227 us      | (21%)         | 486 Mbits/sec  |
| 1k   | 217 us      | 1.79 Gbits/sec | 218 us      | (29%)         | 845 Mbits/sec  |
| 4k   | 275 us      | 5.27 Gbits/sec | 336 us      | (34%)         | 1.21 Gbits/sec |

### 4. Pod to the Node where the Pod is located

| Size | TCP Latency | TCP Bandwidth  | UDP Latency | UDP Lost Rate | UDP Bandwidth  |
|------|-------------|----------------|-------------|---------------|----------------|
| 64   | 12.2 us     | 295 Mbits/sec  | 12.7 us     | (0.27%)       | 74.1 Mbits/sec |
| 128  | 14.1 us     | 549 Mbits/sec  | 10.6 us     | (0.41%)       | 153 Mbits/sec  |
| 512  | 13.5 us     | 1.83 Gbits/sec | 12.7 us     | (0.23%)       | 586 Mbits/sec  |
| 1k   | 12 us       | 2.69 Gbits/sec | 13 us       | (1%)          | 1.16 Gbits/sec |
| 4k   | 18.9 us     | 4.51 Gbits/sec | 21.8 us     | (0.42%)       | 1.81 Gbits/sec |

| Size | TCP Latency | TCP Bandwidth  | UDP Latency | UDP Lost Rate | UDP Bandwidth  |
|------|-------------|----------------|-------------|---------------|----------------|
| 64   | 10.4 us     | 335 Mbits/sec  | 12.2 us     | (0.75%)       | 95.4 Mbits/sec |
| 128  | 12.1 us     | 561 Mbits/sec  | 11.3 us     | (0.25%)       | 194 Mbits/sec  |
| 512  | 11.6 us     | 1.87 Gbits/sec | 10.7 us     | (0.66%)       | 745 Mbits/sec  |
| 1k   | 12.7 us     | 3.12 Gbits/sec | 10.9 us     | (1.2%)        | 1.46 Gbits/sec |
| 4k   | 16.5 us     | 8.23 Gbits/sec | 17.9 us     | (1.5%)        | 2.51 Gbits/sec |

## 5. Pod to the Node where the Pod is not located

| Size | TCP Latency | TCP Bandwidth  | UDP Latency | UDP Lost Rate | UDP Bandwidth  |
|------|-------------|----------------|-------------|---------------|----------------|
| 64   | 234 us      | 153 Mbits/sec  | 232 us      | (63%)         | 29.4 Mbits/sec |
| 128  | 237 us      | 261 Mbits/sec  | 238 us      | (49%)         | 76.1 Mbits/sec |
| 512  | 231 us      | 701 Mbits/sec  | 238 us      | (57%)         | 279 Mbits/sec  |
| 1k   | 256 us      | 1.05 Gbits/sec | 228 us      | (56%)         | 524 Mbits/sec  |
| 4k   | 330 us      | 1.08 Gbits/sec | 359 us      | (1.5%)        | 35.7 Mbits/sec |

| Size | TCP Latency | TCP Bandwidth  | UDP Latency | UDP Lost Rate | UDP Bandwidth  |
|------|-------------|----------------|-------------|---------------|----------------|
| 64   | 283 us      | 141 Mbits/sec  | 230 us      | (26%)         | 55.8 Mbits/sec |
| 128  | 234 us      | 255 Mbits/sec  | 234 us      | (25%)         | 113 Mbits/sec  |
| 512  | 246 us      | 760 Mbits/sec  | 234 us      | (22%)         | 458 Mbits/sec  |
| 1k   | 268 us      | 1.23 Gbits/sec | 242 us      | (20%)         | 879 Mbits/sec  |
| 4k   | 326 us      | 1.20 Gbits/sec | 369 us      | (0.5%)        | 7.87 Mbits/sec |

## 6. Pod to the cluster ip service

| Size | TCP Latency | TCP Bandwidth  | UDP Latency | UDP Lost Rate | UDP Bandwidth  |
|------|-------------|----------------|-------------|---------------|----------------|
| 64   | 237 us      | 133 Mbits/sec  | 213 us      | (65%)         | 25.5 Mbits/sec |
| 128  | 232 us      | 271 Mbits/sec  | 222 us      | (62%)         | 54.8 Mbits/sec |
| 512  | 266 us      | 800 Mbits/sec  | 234 us      | (60%)         | 232 Mbits/sec  |
| 1k   | 248 us      | 986 Mbits/sec  | 239 us      | (50%)         | 511 Mbits/sec  |
| 4k   | 314 us      | 1.03 Gbits/sec | 367 us      | (0.6%)        | 13.2 Mbits/sec |

| TCP-Conn-Number | QPS      | Avg-Resp-Time | Stdev-Resp-Time | Max-Resp-Time |
|-----------------|----------|---------------|-----------------|---------------|
| 10              | 14305.17 | 0.87ms        | 1.48ms          | 24.46ms       |
| 100             | 29082.07 | 3.87ms        | 4.35ms          | 102.85ms      |

| Size | TCP Latency | TCP Bandwidth  | UDP Latency | UDP Lost Rate | UDP Bandwidth  |
|------|-------------|----------------|-------------|---------------|----------------|
| 64   | 241 us      | 145 Mbits/sec  | 225 us      | (19%)         | 60.2 Mbits/sec |
| 128  | 245 us      | 261 Mbits/sec  | 212 us      | (15%)         | 123 Mbits/sec  |
| 512  | 252 us      | 821 Mbits/sec  | 219 us      | (14%)         | 499 Mbits/sec  |
| 1k   | 253 us      | 1.08 Gbits/sec | 242 us      | (16%)         | 852 Mbits/sec  |
| 4k   | 320 us      | 1.32 Gbits/sec | 360 us      | (0.47%)       | 6.70 Mbits/sec |

| TCP-Conn-Number | QPS      | Avg-Resp-Time | Stdev-Resp-Time | Max-Resp-Time |
|-----------------|----------|---------------|-----------------|---------------|
| 10              | 13634.07 | 0.96ms        | 1.72ms          | 30.07ms       |
| 100             | 30215.23 | 3.59ms        | 3.20ms          | 77.56ms       |

#### 7. Host to the Node port service where the Pod is not located on the target Node

| TCP-Conn-Number | QPS      | Avg-Resp-Time | Stdev-Resp-Time | Max-Resp-Time |
|-----------------|----------|---------------|-----------------|---------------|
| 10              | 14802.73 | 0.88ms        | 1.66ms          | 31.49ms       |
| 100             | 29809.58 | 3.78ms        | 4.12ms          | 105.34ms      |

| TCP-Conn-Number | QPS      | Avg-Resp-Time | Stdev-Resp-Time | Max-Resp-Time |
|-----------------|----------|---------------|-----------------|---------------|
| 10              | 14273.33 | 0.90ms        | 1.60ms          | 37.16ms       |
| 100             | 30757.81 | 3.62ms        | 3.41ms          | 59.78ms       |

#### 8. Host to the Node port service where the Pod is located on the target Node

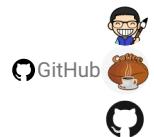
| TCP-Conn-Number | QPS      | Avg-Resp-Time | Stdev-Resp-Time | Max-Resp-Time |
|-----------------|----------|---------------|-----------------|---------------|
| 10              | 15402.39 | 802.50us      | 1.42ms          | 30.91ms       |
| 100             | 29424.66 | 4.05ms        | 4.31ms          | 90.60ms       |

| TCP-Conn-Number | QPS      | Avg-Resp-Time | Stdev-Resp-Time | Max-Resp-Time |
|-----------------|----------|---------------|-----------------|---------------|
| 10              | 14649.21 | 0.91ms        | 1.72ms          | 43.92ms       |
| 100             | 32143.61 | 3.66ms        | 3.76ms          | 67.02ms       |



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3.9.4

---

## 3.10 LoadBalancer Service



1. multus-cni macvlan cni
2. LoadBalancer Service VPC vpc-nat-gw macvlan
3. VPC VPC LoadBalancer VPC VPC

### 3.10.1 VPC LoadBalancer Service

```
kube-system namespace deployment kube-ovn-controller args --enable-lb-svc=true false
```

```
containers:
- args:
  - /kube-ovn/start-controller.sh
  - --default-cidr=10.16.0.0/16
  - --default-gateway=10.16.0.1
  - --default-gateway-check=true
  - --enable-lb-svc=true
  // true
```

#### NetworkAttachmentDefinition CRD

```
yaml net-attach-def
```

```
apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: lb-svc-attachment
  namespace: kube-system
spec:
  config: '{
    "cniVersion": "0.3.0",
    "type": "macvlan",
    "master": "eth0",
    "mode": "bridge"
  }'
```

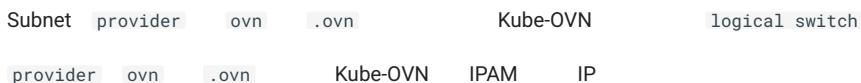
```
eth0 master
```

#### Subnet

```
Subnet LoadBalancer Service LoadBalancerIP Underlay Subnet
```

```
yaml
```

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: attach-subnet
spec:
  protocol: IPv4
  provider: lb-svc-attachment.kube-system # provider
  net-attach-def: Name.Namespace
  cidrBlock: 172.18.0.0/16
  gateway: 172.18.0.1
  excludeIps:
  - 172.18.0.0..172.18.0.10
```



## LoadBalancer Service

yaml LoadBalancer Service

```
apiVersion: v1
kind: Service
metadata:
  annotations:
    lb-svc-attachment.kube-system.kubernetes.io/logical_switch: attach-subnet  #
    ovn.kubernetes.io/attachmentprovider: lb-svc-attachment.kube-system          #
  labels:
    app: dynamic
    name: test-service
    namespace: default
spec:
  loadBalancerIP: 172.18.0.18
  ports:
    - name: test
      protocol: TCP
      port: 80
      targetPort: 80
  selector:
    app: dynamic
    sessionAffinity: None
  type: LoadBalancer
```

| yaml annotation ovn.kubernetes.io/attachmentprovider | net-attach-def | Name.Namespace      | annotation                                  | Pod |
|--|----------------|---------------------|---|-----|
| net-attach-def                                       |                |                     |   |     |
| annotation   | annotation key | net-attach-def      | Name.Namespace.kubernetes.io/logical_switch |     |
| LoadBalancerIP                                       |                | LoadBalancerIP      |   |     |
| LoadBalancerIP                                       |                | spec.loadBalancerIP |   |     |

yaml Service Service Namespace Pod

```
# kubectl get pod
NAME                               READY   STATUS    RESTARTS   AGE
lb-svc-test-service-6869d98dd8-cjvll   1/1     Running   0          107m
# kubectl get svc
NAME            TYPE        CLUSTER-IP      EXTERNAL-IP      PORT(S)      AGE
test-service    LoadBalancer  10.109.201.193  172.18.0.18   80:30056/TCP  107m
```

service.spec.loadBalancerIP service external-ip

Pod yaml

```
# kubectl get pod -o yaml lb-svc-test-service-6869d98dd8-cjvll
apiVersion: v1
kind: Pod
metadata:
  annotations:
    k8s.v1.cni.cncf.io/network-status: |-
      [ {
        "name": "kube-ovn",
        "ips": [
          "10.16.0.2"
        ],
        "default": true,
        "dns": {}
      }, {
        "name": "default/test-service",
        "interface": "net1",
        "mac": "ba:85:f7:02:9f:42",
        "dns": {}
      } ]
    k8s.v1.cni.cncf.io/networks: default/test-service
    k8s.v1.cni.cncf.io/networks-status: |-
      [ {
        "name": "kube-ovn",
        "ips": [
          "10.16.0.2"
        ],
        "default": true,
        "dns": {}
      }, {
        "name": "default/test-service",
        "interface": "net1",
        "mac": "ba:85:f7:02:9f:42",
        "dns": {}
      } ]
  ovn.kubernetes.io/allocated: "true"
  ovn.kubernetes.io/cidr: 10.16.0.0/16
  ovn.kubernetes.io/gateway: 10.16.0.1
```

```

ovn.kubernetes.io/ip_address: 10.16.0.2
ovn.kubernetes.io/logical_router: ovn-cluster
ovn.kubernetes.io/logical_switch: ovn-default
ovn.kubernetes.io/mac_address: 00:00:00:45:F4:29
ovn.kubernetes.io/pod_nic_type: veth-pair
ovn.kubernetes.io/routed: "true"
test-service.default.kubernetes.io/allocated: "true"
test-service.default.kubernetes.io/cidr: 172.18.0.0/16
test-service.default.kubernetes.io/gateway: 172.18.0.1
test-service.default.kubernetes.io/ip_address: 172.18.0.18
test-service.default.kubernetes.io/logical_switch: attach-subnet
test-service.default.kubernetes.io/mac_address: 00:00:00:AF:AA:BF
test-service.default.kubernetes.io/pod_nic_type: veth-pair

```

## Service

```

# kubectl get svc -o yaml test-service
apiVersion: v1
kind: Service
metadata:
  annotations:
    kubectl.kubernetes.io/last-applied-configuration: |
      {"apiVersion":"v1","kind":"Service","metadata":{"annotations":{"test-service.default.kubernetes.io/logical_switch":"attach-subnet"},"labels":{"app":"dynamic","name":"test-service","namespace":"default"},"spec":{"ports":[{"name":"test","port":80,"protocol":"TCP","targetPort":80}],"selector":{"app":"dynamic","sessionAffinity":"None","type":"LoadBalancer"}}}
    ovn.kubernetes.io/vpc: ovn-cluster
    test-service.default.kubernetes.io/logical_switch: attach-subnet
  creationTimestamp: "2022-06-15T09:01:58Z"
  labels:
    app: dynamic
  name: test-service
  namespace: default
  resourceVersion: "38485"
  uid: 161edee1-7f6e-40f5-9e09-5a52c44267d0
spec:
  allocateLoadBalancerNodePorts: true
  clusterIP: 10.109.201.193
  clusterIPs:
  - 10.109.201.193
  externalTrafficPolicy: Cluster
  internalTrafficPolicy: Cluster
  ipFamilies:
  - IPv4
  ipFamilyPolicy: SingleStack
  ports:
  - name: test
    nodePort: 30056
    port: 80
    protocol: TCP
    targetPort: 80
  selector:
    app: dynamic
    sessionAffinity: None
    type: LoadBalancer
  status:
    loadBalancer:
      ingress:
      - ip: 172.18.0.18

```

## 3.10.2 LoadBalancerIP

yaml, Pod Service Endpoints

```

apiVersion: apps/v1
kind: Deployment
metadata:
  labels:
    app: dynamic
  name: dynamic
  namespace: default
spec:
  replicas: 2
  selector:
    matchLabels:
      app: dynamic
  strategy:
    rollingUpdate:
      maxSurge: 25%
      maxUnavailable: 25%
    type: RollingUpdate
  template:
    metadata:
      creationTimestamp: null
      labels:
        app: dynamic
    spec:
      containers:
      - image: docker.io/library/nginx:alpine

```

```
imagePullPolicy: IfNotPresent
name: nginx
dnsPolicy: ClusterFirst
restartPolicy: Always
```

#### Service LoadBalancerIP:Port

```
# curl 172.18.0.18:80
<html>
<head>
  <title>Hello World!</title>
  <link href='//fonts.googleapis.com/css?family=Open+Sans:400,700' rel='stylesheet' type='text/css'>
  <style>
    body {
      background-color: white;
      text-align: center;
      padding: 50px;
      font-family: "Open Sans", "Helvetica Neue", Helvetica, Arial, sans-serif;
    }
    #logo {
      margin-bottom: 40px;
    }
  </style>
</head>
<body>
  <h1>Hello World!</h1>
  <h3>Links found</h3>
  <h3>I am on dynamic-7d8d7874f5-hsgc4</h3>
  <h3>Cookie =/>
  <b>KUBERNETES</b> listening in 443 available at tcp://10.96.0.1:443<br />
  <h3>my name is hanhouchao!</h3>
  <h3> RequestURI='/'</h3>
</body>
</html>
```

#### Service Pod

```
# ip a
4: net1@if62: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default
  link/ether ba:85:f7:02:9f:42 brd ff:ff:ff:ff:ff:ff link-netnsid 0
  inet 172.18.0.18/16 scope global net1
    valid_lft forever preferred_lft forever
  inet6 fe80::ba85:f7ff:fe02:9f42/64 scope link
    valid_lft forever preferred_lft forever
36: eth0@if37: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1400 qdisc noqueue state UP group default
  link/ether 00:00:00:45:f4:29 brd ff:ff:ff:ff:ff:ff link-netnsid 0
  inet 10.16.0.2/16 brd 10.16.255.255 scope global eth0
    valid_lft forever preferred_lft forever
  inet6 fe80::200:ff:fe45:f429/64 scope link
    valid_lft forever preferred_lft forever

# ip rule
0: from all lookup local
32764: from all iif eth0 lookup 100
32765: from all iif net1 lookup 100
32766: from all lookup main
32767: from all lookup default

# ip route show table 100
default via 172.18.0.1 dev net1
10.109.201.193 via 10.16.0.1 dev eth0
172.18.0.0/16 dev net1 scope link

# iptables -t nat -L -n -v
Chain PREROUTING (policy ACCEPT 0 packets, 0 bytes)
  pkts bytes target     prot opt in     out     source        destination
    0     0 DNAT       tcp   --  *      *       0.0.0.0/0    172.18.0.18        tcp  dpt:80  to:10.109.201.193:80

Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
  pkts bytes target     prot opt in     out     source        destination

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
  pkts bytes target     prot opt in     out     source        destination

Chain POSTROUTING (policy ACCEPT 0 packets, 0 bytes)
  pkts bytes target     prot opt in     out     source        destination
    0     0 MASQUERADE  all   --  *      *       0.0.0.0/0    10.109.201.193
```

#### lb service Pod nodeSelector

```
ovn-vpc-nat-config ConfigMap nodeSelector LoadBalancer service Pod
```

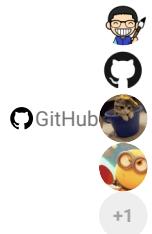
```
apiVersion: v1
data:
  image: docker.io/kubeovn/vpc-nat-gateway:v1.14.0
  nodeSelector: |
    kubernetes.io/hostname: kube-ovn-control-plane
```

```
kubernetes.io/os: linux
kind: ConfigMap
metadata:
  name: ovn-vpc-nat-config
  namespace: kube-system
```

[!\[\]\(0e5aeb08abccf3e048d904d9c746b4a5\_img.jpg\) PDF](#)[!\[\]\(022efc2a5277100d1fc87484bbe6625f\_img.jpg\) Slack](#)[!\[\]\(4d7832f32da92348575447a4aae88cd6\_img.jpg\) Support](#)

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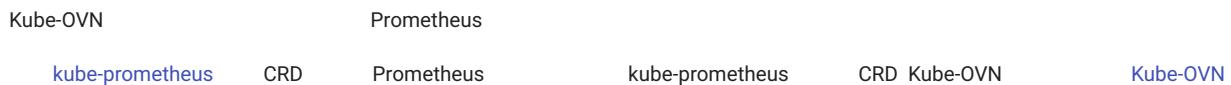
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3.10.3

---

## 3.11



### 3.11.1 Prometheus Monitor

Kube-OVN    Prometheus Monitor CRD

```

#
kubectl apply -f https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/monitoring/pinger-monitor.yaml
# kube-ovn-controller
kubectl apply -f https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/monitoring/controller-monitor.yaml
# kube-ovn-cni
kubectl apply -f https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/monitoring/cni-monitor.yaml
# ovn
kubectl apply -f https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/monitoring/ovn-monitor.yaml

```

Prometheus    15s    yaml    interval

### 3.11.2 Grafana

Kube-OVN    Grafana Dashboard

Dashboard

```

#
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/monitoring/pinger-grafana.json
# kube-ovn-controller
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/monitoring/controller-grafana.json
# kube-ovn-cni
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/monitoring/cni-grafana.json
# ovn
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/monitoring/ovn-grafana.json
# ovs
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/monitoring/ovs-grafana.json

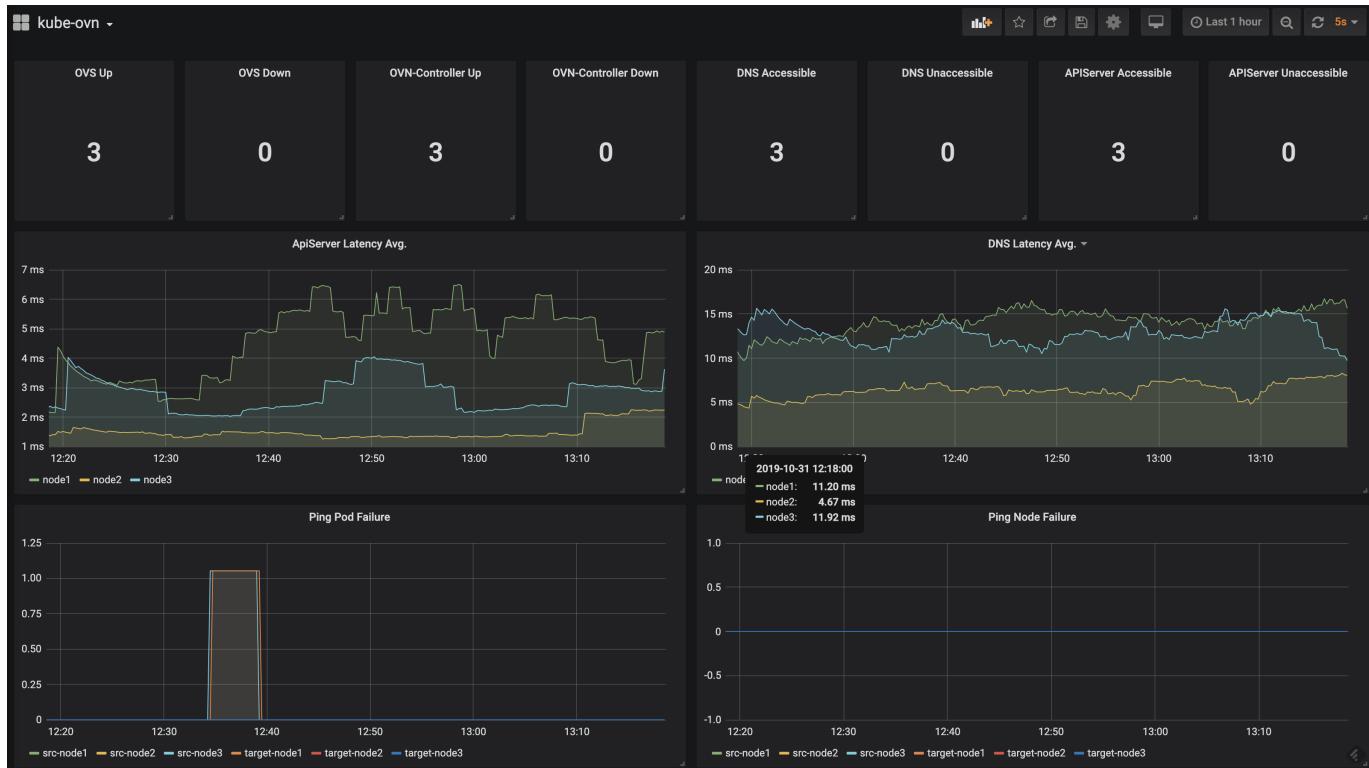
```

Grafana    Prometheus    Dashboard

kube-ovn-controller



## kube-ovn-pinger

**kube-ovn-cni**[PDF](#)[Slack](#)[Support](#)

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3.11.3

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## 3.12

---

### 3.12.1 NetworkPolicy

NetworkPolicy Kubernetes Pod Pod Kube-OVN OVN ACL Kubernetes NetworkPolicy  
NetworkPolicy

#### Kube-OVN

Kube-OVN OVN Open Virtual Network NetworkPolicy OVN

##### POR T GROUP

| NetworkPolicy | Kube-OVN | Port Group | podSelector | Pod | Port Group | < >.< > | - | . |
|---------------|----------|------------|-------------|-----|------------|---------|---|---|
|---------------|----------|------------|-------------|-----|------------|---------|---|---|

##### ADDRESS SET

| Address Set | NetworkPolicy | IP | NetworkPolicy | Kube-OVN | podSelector | namespaceSelector | ipBlock |
|-------------|---------------|----|---------------|----------|-------------|-------------------|---------|
| IP          | Address Set   |    |               |          |             |                   |         |

NetworkPolicy Ingress Egress Allow Except Address Set

- < >.< >.ingress.allow IP
- < >.< >.ingress.exception IP
- < >.< >.egress.allow IP
- < >.< >.egress.exception IP

##### ACL

| ACL | OVN | Kube-OVN | NetworkPolicy | OVN ACL | Port Group | ACL |
|-----|-----|----------|---------------|---------|------------|-----|
|-----|-----|----------|---------------|---------|------------|-----|

Kube-OVN NetworkPolicy ACL

- Ingress Allow 2001
- Egress Allow 2001
- Default Deny 1000

Kube-OVN Kubernetes NetworkPolicy OVN ACL

#### Kube-OVN

- **NetworkPolicy** Kubernetes
- **Network Policy API** AdminNetworkPolicy BaselineAdminNetworkPolicy
- **Subnet ACL**
- **Security Group**

OVN ACL NetworkPolicy Network Policy API

##### NAMED PORT

NetworkPolicy Named Port

```
ports:
- protocol: TCP
  port: http
```

Kube-OVN Named Port

**Named Port**

```
Pod      Named Port
port: http  NetworkPolicy
```

```
Named Port    Pod
```

IPBLOCK EXCEPT

```
NetworkPolicy ipBlock      except      IP
```

```
egress:
- to:
  - ipBlock:
    cidr: 10.0.0.0/8
    except:
    - 10.0.1.0/24
    - 10.0.2.0/24
```

```
OVN      except      except      ACL      OVN
```

```
except      IP
```

- CIDR
- podSelector namespaceSelector IP

### NetworkPolicy

Kube-OVN NetworkPolicy

#### ⚠ Warning

```
NetworkPolicy      CPU
```

```
ovn.kubernetes.io/acl_log_meter_rate annotation      ACL
```

```
NetworkPolicy      annotation ovn.kubernetes.io/enable_log
```

```
apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
  name: default-deny-ingress
  namespace: default
  annotations:
    ovn.kubernetes.io/enable_log: "true"
spec:
  podSelector: {}
  policyTypes:
  - Ingress
```

Drop

```
Pod      /var/log/ovn/ovn-controller.log
```

```
# tail -f /var/log/ovn/ovn-controller.log
2022-07-20T05:55:03.229Z|00394|acl_log(ovn_pinctrl0)|INFO|name="np/default-deny-ingress.default/IPv4/0", verdict=drop, severity=warning, direction=to-lport:
udp,vlan_tci=0x0000,d1_src=00:00:00:21:b7:d1,d1_dst=00:00:00:8d:0b:86,nw_src=10.16.0.10,nw_dst=10.16.0.7,nw_tos=0,nw_ecn=0,nw_ttl=63,tp_src=54343,tp_dst=53
```

```
IP      IP
```

Kube-OVN v1.13.0

```
ovn.kubernetes.io/log_acl_actions annotation
```

Allow

```

apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
  name: allow-from-client
  namespace: default
  annotations:
    ovn.kubernetes.io/enable_log: "true"
    ovn.kubernetes.io/log_acl_actions: "allow"
spec:
  podSelector:
    matchLabels:
      app: web
  policyTypes:
  - Ingress
  ingress:
  - from:
    - podSelector:
        matchLabels:
          app: client

```

ovn.kubernetes.io/log\_acl\_actions

- drop
- allow
- allow,drop

```

# tail -f /var/log/ovn/ovn-controller.log
2024-08-14T09:27:49.590Z|00004|acl_log(ovn_pinctrl0)|INFO|name="np/allow-from-client.default/ingress/IPv4/0", verdict=allow, severity=info, direction=to-lport: icmp,vlan_tci=0x0000,d1_src=96:7b:b0:2f:a0:1a,d1_dst=a6:e5:1b:c2:1b:f8,nw_src=10.16.0.7,nw_dst=10.
16.0.12,nw_tos=0,nw_ecn=0,nw_ttl=64,nw_frag=no,icmp_type=8,icmp_code=0

```

ovn.kubernetes.io/acl\_log\_meter\_rate annotation

```

apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
  name: allow-from-client
  namespace: default
  annotations:
    ovn.kubernetes.io/enable_log: "true"
    ovn.kubernetes.io/log_acl_actions: "allow"
    ovn.kubernetes.io/acl_log_meter_rate: "100"
spec:
  podSelector:
    matchLabels:
      app: web
  policyTypes:
  - Ingress
  ingress:
  - from:
    - podSelector:
        matchLabels:
          app: client

```

ovn.kubernetes.io/acl\_log\_meter\_rate / 100 100

annotation ovn.kubernetes.io/enable\_log false

```
kubectl annotate networkpolicy -n default allow-from-client ovn.kubernetes.io/enable_log=false --overwrite
```

## Kube-OVN

|                          |               |      |    |    |      |     |
|--------------------------|---------------|------|----|----|------|-----|
| • <b>standard</b>        | NetworkPolicy | IP   |    |    |      |     |
| • <b>lax</b>             | TCP/UDP/SCTP  | ICMP | L4 | IP | DHCP | UDP |
| NetworkPolicy annotation |               |      |    |    |      |     |

```
apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
  name: example-policy
  namespace: default
  annotations:
    ovn.kubernetes.io/enforcement: "lax"
spec:
  podSelector: {}
  policyTypes:
  - Ingress
```

Kube-OVN

--network-policy-enforcement



PDF



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Support

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GitHub



### 3.12.2

Kubernetes    NetworkPolicy    L3 L4    AdminNetworkPolicy (ANP)    Pod  
 DNSNameResolver CoreDNS

NetworkPolicy    OVN    AddressSet    IP    IP    OVN    AddressSet    DNS

1. kube-ovn-controller    AdminNetworkPolicy    DNSNameResolver CR
2. CoreDNS    DNSNameResolver CR    IP    DNSNameResolver status
3. kube-ovn-controller    DNSNameResolver CR    status    AddressSet

IP    Deny    Allow    Allow    Deny

ANP BANP CRD

AdminNetworkPolicy    CRD

```
kubectl apply -f https://raw.githubusercontent.com/kubernetessigs/network-policy-api/refs/heads/main/config/crd/experimental/policy.networking.k8s.io_adminnetworkpolicies.yaml
kubectl apply -f https://raw.githubusercontent.com/kubernetessigs/network-policy-api/refs/heads/main/config/crd/experimental/policy.networking.k8s.io_baselineadminnetworkpolicies.yaml
```

DNSNAMERESOLVER

DNSNameResolver

```
kubectl apply -f https://raw.githubusercontent.com/kubeovn/dnsnameresolver/refs/heads/main/manifest/crd.yaml
kubectl apply -f https://raw.githubusercontent.com/kubeovn/dnsnameresolver/refs/heads/main/manifest/rbac.yaml
kubectl apply -f https://raw.githubusercontent.com/kubeovn/dnsnameresolver/refs/heads/main/manifest/cm.yaml
```

COREDNS

DNSNameResolver    CoreDNS

```
kubectl set image deployment/coredns coredns=kubeovn/dnsnameresolver:dev -n kube-system
```

CoreDNS

```
kubectl get pod -n kube-system -l k8s-app=kube-dns
```

ANP

kube-ovn-controller

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: kube-ovn-controller
spec:
  template:
    spec:
      containers:
        - name: kube-ovn-controller
          args:
            - --enable-anp=true
            - --enable-dns-name-resolver=true
          # ...
```

```

apiVersion: policy.networking.k8s.io/v1alpha1
kind: AdminNetworkPolicy
metadata:
  name: deny-external-domains
spec:
  priority: 55
  subject:
    namespaces:
      matchLabels:
        kubernetes.io/metadata.name: kube-system
  egress:
  - action: Deny
    name: deny-baidu-google
    to:
    - domainNames:
      - '*.baidu.com.'
      - '*.google.com.'

```

|             |                 |
|-------------|-----------------|
| priority    |                 |
| subject     | Pod             |
| egress      |                 |
| action      | Allow Deny Pass |
| domainNames |                 |

## kube-ovn-pinger

```
#  
kubectl exec -it -n kube-system kube-ovn-pinger-xxxxx -- ping baidu.com
```

DNS    ACL

### DNSNameResolver

```
# kubectl get dnsnameresolver  
NAME          DNS NAME      RESOLVED IPS  
anp-deny-external-domains-88dc32ab  *.google.com.  
anp-deny-external-domains-fb3029ce  *.baidu.com.  220.181.7.203
```

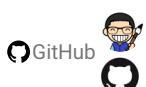
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### 3.12.3

Pod                    Pod                    Kube-OVN IPAM            MAC            IP

- Pod      IP
- Pod      MAC      ARP
- 

OVN   Port Security            Pod                    Kube-OVN      OVN

- MAC      IP
- OVN                    MAC      IP
- IPAM
- OVN

OVN

Pod      [ovn.kubernetes.io/port\\_security annotation](#)

```
apiVersion: v1
kind: Pod
metadata:
  name: secure-pod
  annotations:
    ovn.kubernetes.io/port_security: "true"
spec:
  containers:
  - name: nginx
    image: docker.io/library/nginx:alpine
```

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[!\[\]\(d6de11b59c78ac18c3501dfde89d3eac\_img.jpg\) Slack](#)

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 GitHub 

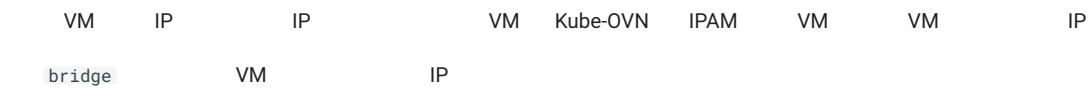
## 4. KubeVirt

---

### 4.1 VM IP



#### 4.1.1 IP VM



##### 1. VM

```

apiVersion: kubevirt.io/v1
kind: VirtualMachine
metadata:
  name: testvm
spec:
  runStrategy: Always
  template:
    metadata:
      labels:
        kubevirt.io/size: small
        kubevirt.io/domain: testvm
      annotations:
        kubevirt.io/allow-pod-bridge-network-live-migration: "true"
    spec:
      domain:
        devices:
          disks:
            - name: containerdisk
              disk:
                bus: virtio
            - name: cloudinitdisk
              disk:
                bus: virtio
          interfaces:
            - name: default
              bridge: {}
        resources:
          requests:
            memory: 64M
      networks:
        - name: default
          pod: {}
      volumes:
        - name: containerdisk
          containerDisk:
            image: quay.io/kubevirt/cirros-container-disk-demo
        - name: cloudinitdisk

```

```
cloudInitNoCloud:
  userDataBase64: SGkuXG4=
```

### 1. VM

```
kubectl get vmi testvm
```

### 1. VM

```
virtctl restart testvm
```

### 1. VM

```
virtctl migrate testvm
```

bridge    VM         IP

## 4.1.2 IP/Mac

| VM | IP/Mac | VM | annotation | VM | IP | KubeVirt |
|----|--------|----|------------|----|----|----------|
|----|--------|----|------------|----|----|----------|

```
apiVersion: kubevirt.io/v1
kind: VirtualMachine
metadata:
  name: testvm
spec:
  runStrategy: Always
  template:
    metadata:
      labels:
        kubevirt.io/size: small
        kubevirt.io/domain: testvm
    annotations:
      ovn.kubernetes.io/ip_address: 10.16.0.15 #(1)
      ovn.kubernetes.io/mac_address: 00:00:00:53:6B:B6 #(2)
      kubevirt.io/allow-pod-bridge-network-live-migration: "true"
    spec:
      domain:
        devices:
          disks:
            - name: containerdisk
              disk:
                bus: virtio
            - name: cloudinitdisk
              disk:
                bus: virtio
          interfaces:
            - name: default
              bridge: {}
        resources:
          requests:
            memory: 64M
      networks:
        - name: default
          pod: {}
      volumes:
        - name: containerdisk
          containerDisk:
            image: quay.io/kubevirt/cirros-container-disk-demo
        - name: cloudinitdisk
          cloudInitNoCloud:
            userDataBase64: SGkuXG4=
```

1. 🖥 IP

2. 🖥 Mac

### ⚠ Warning

|                 |   |     |     |          |
|-----------------|---|-----|-----|----------|
| KubeVirt VM API | spec.template.spec.domain.devices.interfaces.macAddress | Mac | Mac | Kube-OVN |
| annotation      | Mac   | Mac |     |          |

## 4.1.3 VM IP

| Kube-OVN | VM IP | IP | VM |
|----------|-------|----|----|
|----------|-------|----|----|

## VM IP

1. VM Annotation IP
2. `virtctl restart <vm name>` VM IP

## 4.1.4

VM IP VM ovn.kubernetes.io/logical\_switch

```
apiVersion: kubevirt.io/v1
kind: VirtualMachine
metadata:
  name: testvm
spec:
  runStrategy: Always
  template:
    metadata:
      labels:
        kubevirt.io/size: small
        kubevirt.io/domain: testvm
    annotations:
      ovn.kubernetes.io/logical_switch: subnet1 #(1)
      kubevirt.io/allow-pod-bridge-network-live-migration: "true"
  spec:
    domain:
      devices:
        disks:
          - name: containerdisk
            disk:
              bus: virtio
          - name: cloudinitdisk
            disk:
              bus: virtio
        interfaces:
          - name: default
            bridge: {}
    resources:
      requests:
        memory: 64M
  networks:
    - name: default
      pod: {}
  volumes:
    - name: containerdisk
      containerDisk:
        image: quay.io/kubevirt/cirros-container-disk-demo
    - name: cloudinitdisk
      cloudInitNoCloud:
        userDataBase64: SGkuXG4=
```

1. 🛠 VM

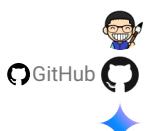
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## 4.1.5

## 4.2

| KubeVirt | Clone | Label | Annotation | Kube-OVN | Annotation | IP | MAC |
|----------|-------|-------|------------|----------|------------|----|-----|
|----------|-------|-------|------------|----------|------------|----|-----|

### 4.2.1 Annotation

| VirtualMachineClone | Kube-OVN | Annotation |
|---------------------|----------|------------|
|---------------------|----------|------------|

```

kind: VirtualMachineClone
apiVersion: "clone.kubevirt.io/v1beta1"
metadata:
  name: testclone
spec:
  source:
    apiGroup: kubevirt.io
    kind: VirtualMachine
    name: vm-source
  target:
    apiGroup: kubevirt.io
    kind: VirtualMachine
    name: vm-target
  template:
    annotationFilters:
      - "ovn.kubernetes.io/*"
  
```

### 4.2.2



#### Note

patches KubeVirt 1.6

IP

```

kind: VirtualMachineClone
apiVersion: "clone.kubevirt.io/v1beta1"
metadata:
  name: testclone
spec:
  source:
    apiGroup: kubevirt.io
    kind: VirtualMachine
    name: vm-source
  target:
    apiGroup: kubevirt.io
    kind: VirtualMachine
    name: vm-target
  patches:
    - {"op": "replace", "path": "/spec/template/metadata/annotations/ovn.kubernetes.io~1ip_address", "value": "10.16.0.15"}
  
```

```

kind: VirtualMachineClone
apiVersion: "clone.kubevirt.io/v1beta1"
metadata:
  name: testclone
spec:
  source:
    apiGroup: kubevirt.io
    kind: VirtualMachine
    name: vm-source
  target:
    apiGroup: kubevirt.io
    kind: VirtualMachine
    name: vm-target
  patches:
    - {"op": "remove", "path": "/spec/template/metadata/annotations/ovn.kubernetes.io~1ip_address"}
  
```

Annotation

KubeVirt Clone API



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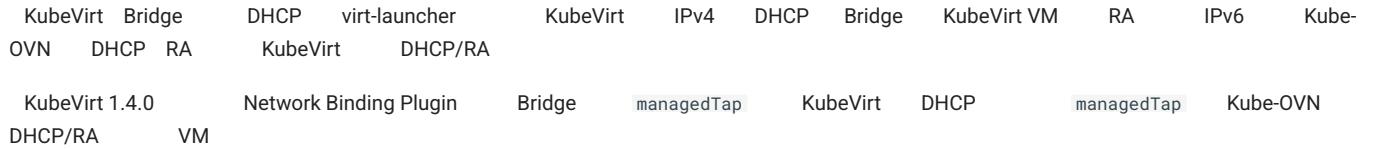
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4.2.3

---

## 4.3



### 4.3.1 DHCP

Kube-OVN Subnet DHCP IPv6 RA YAML

```

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: dual-stack-subnet
spec:
  cidrBlock: "10.244.0.0/16,fd00:10:244::/64"
  enableDHCPS: true
  enableIPv6RA: true
  
```

### 4.3.2 managedTap

KubeVirt managedTap Network Binding Plugin:

```

# kubectl patch kubevirt -n kubevirt kubevirt --type=json -p=
'[{"op": "add", "path": "/spec/configuration/network", "value": {
  "binding": {
    "managedtap": {
      "domainAttachmentType": "managedTap"
    }
  }
}]'
  
```

### 4.3.3 managedTap

```

apiVersion: kubevirt.io/v1
kind: VirtualMachine
metadata:
  name: dual-stack-vm
  namespace: default
spec:
  running: false
  template:
    spec:
      domain:
        devices:
          interfaces:
            - name: default
              binding:
                name: managedtap
      networks:
        - name: default
      pod: {}
  
```

VM DHCP IPv6 RA IPv4/IPv6

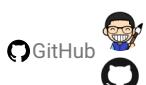
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#### 4.3.4

---

## 4.4

---

### KubeVirt

- KubeVirt      Bridge
- KubeVirt
- IP
- 

Kube-OVN                          0.5                          TCP

### 4.4.1

VM Spec    `kubevirt.io/allow-pod-bridge-network-live-migration: "true"` annotation Kube-OVN

#### 1. VM

```
kubectl apply -f - <<EOF
apiVersion: kubevirt.io/v1
kind: VirtualMachine
metadata:
  name: testvm
spec:
  runStrategy: Always
  template:
    metadata:
      labels:
        kubevirt.io/size: small
        kubevirt.io/domain: testvm
    annotations:
      kubevirt.io/allow-pod-bridge-network-live-migration: "true"
  spec:
    domain:
      devices:
        disks:
          - name: containerdisk
            disk:
              bus: virtio
          - name: cloudinitdisk
            disk:
              bus: virtio
        interfaces:
          - name: default
            bridge: {}
    resources:
      requests:
        memory: 64M
    networks:
      - name: default
        pod: {}
    volumes:
      - name: containerdisk
        containerDisk:
          image: quay.io/kubevirt/cirros-container-disk-demo
      - name: cloudinitdisk
        cloudInitNoCloud:
          userDataBase64: SGkuXG4=
EOF
```

#### 1. SSH

```
# password: gocubsgo
virtctl ssh cirros@testvm
ping 8.8.8.8
```

#### 1.

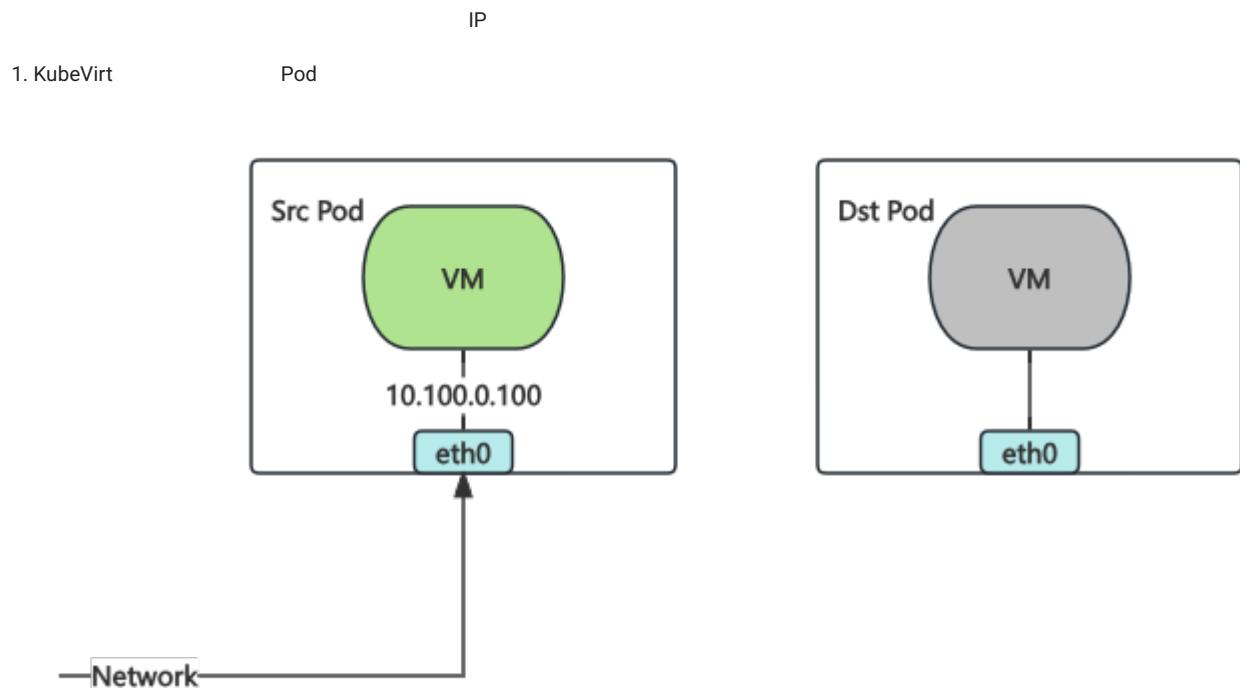
```
virtctl migrate testvm
```

| VM | SSH | ping |
|----|-----|------|
|----|-----|------|

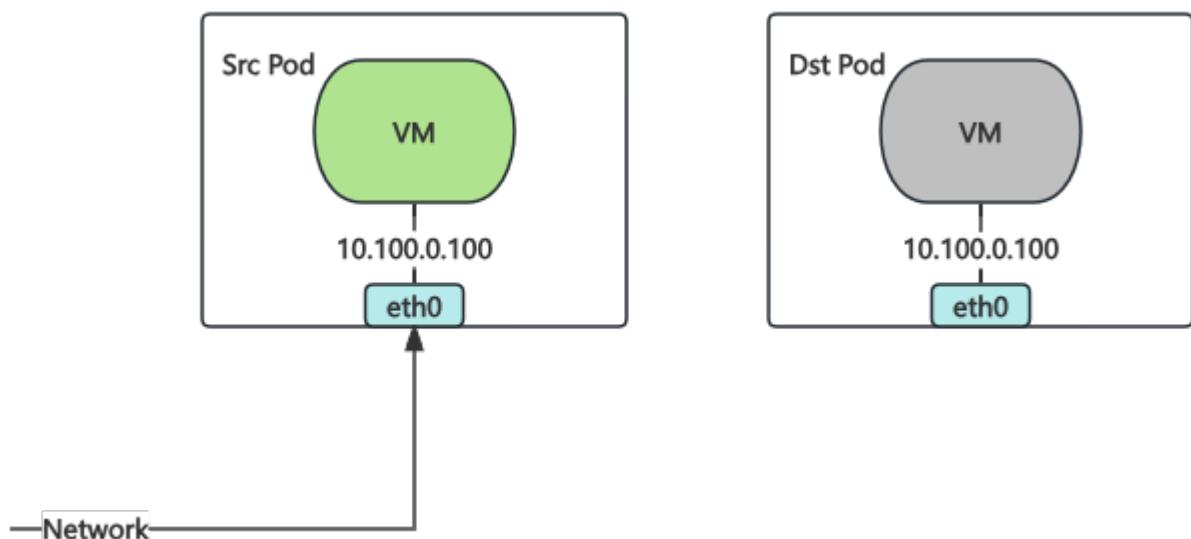
## 4.4.2

Kube-OVN

Live migration - Reducing downtime with multichassis port bindings



1. Kube-OVN Pod Pod Pod



1. Kube-OVN

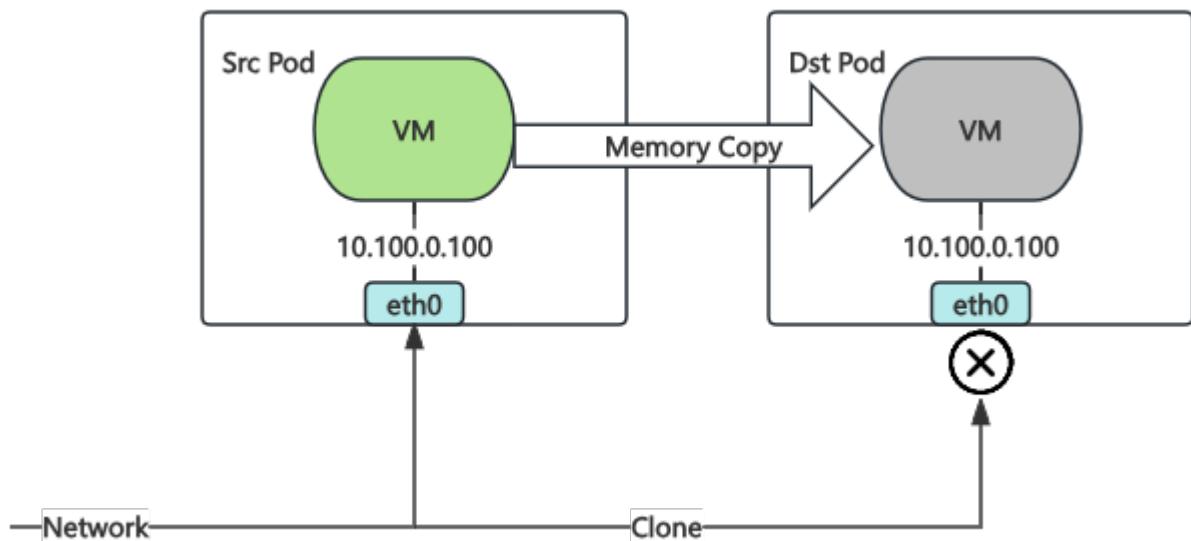
Pod Pod

Pod

Pod



1. KubeVirt VM

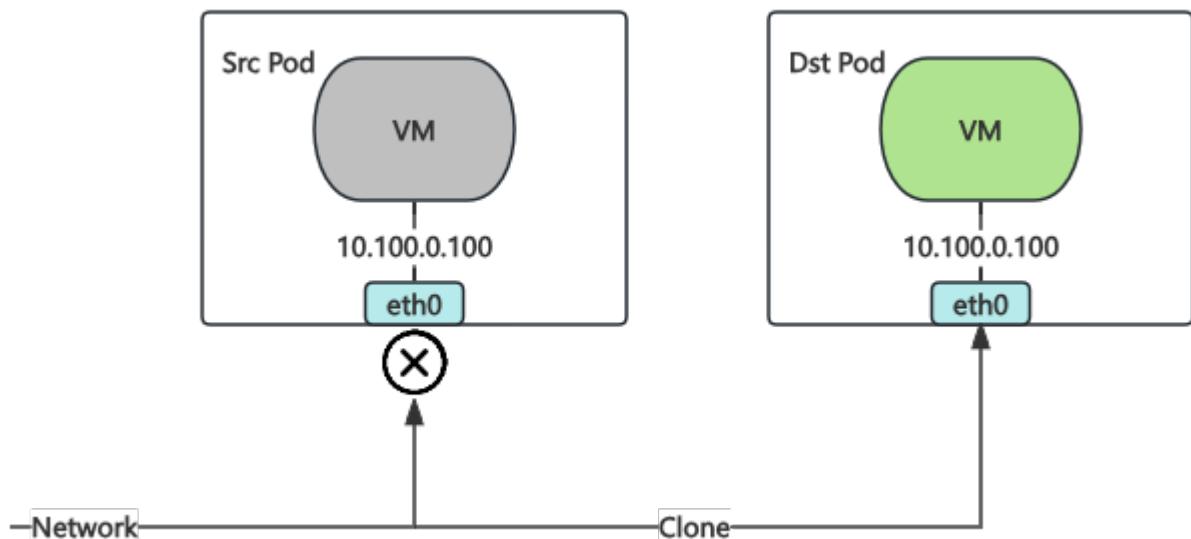


1. KubeVirt

Pod Pod



1. KubeVirt    Pod    libvirt    RARP    Pod    Pod



1. KubeVirt    Pod    Kube-OVN    Watch Migration CR



5 6

libvirt RARP

0.5 TCP



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4.4.3

## 4.5

Kube-OVN Multus Dynamic Networks Controller      KubeVirt v1.4.0      VM

### 4.5.1

Thick      Multus

```
kubectl apply -f https://raw.githubusercontent.com/k8snetworkplumbingwg/multus-cni/refs/heads/master/deployments/multus-daemonset-thick.yml
```

#### Multus Dynamic Networks Controller

```
kubectl apply -f https://raw.githubusercontent.com/k8snetworkplumbingwg/multus-dynamic-networks-controller/refs/heads/main/manifests/dynamic-networks-controller.yaml
```

### 4.5.2

#### NetworkAttachmentDefinition

provider      ovn

```
apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: attachnet
  namespace: default
spec:
  config: '{
    "cniVersion": "0.3.0",
    "type": "kube-ovn",
    "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
    "provider": "attachnet.default.ovn"
  }'
```

- spec.config.type:      kube-ovn      CNI      Kube-OVN
- server\_socket: Kube-OVN      socket      /run/openvswitch/kube-ovn-daemon.sock
- provider:      NetworkAttachmentDefinition      <name>.<namespace>.ovn , Kube-OVN      Subnet      ovn

#### Kube-OVN Subnet

Kube-OVN      provider      NetworkAttachmentDefinition      <name>.<namespace>.ovn      ovn      Kube-OVN      Subnet

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: attachnet
spec:
  protocol: IPv4
  provider: attachnet.default.ovn
  cidrBlock: 172.17.0.0/16
  gateway: 172.17.0.1
  excludeIps:
    - 172.17.0.0..172.17.0.10
```

### 4.5.3 VM

yaml      VM

```
apiVersion: kubevirt.io/v1
kind: VirtualMachine
metadata:
  name: vm-fedora
spec:
  runStrategy: Always
  template:
    spec:
      domain:
```

```

devices:
  disks:
    - disk:
        bus: virtio
        name: containerdisk
  interfaces:
    - masquerade: {}
      name: defaultnetwork
  rng: {}
resources:
  requests:
    memory: 1024M
networks:
  - name: defaultnetwork
    pod: {}
terminationGracePeriodSeconds: 0
volumes:
  - containerDisk:
      image: quay.io/kubevirt/fedora-with-test-tooling-container-disk:devel
      name: containerdisk

```

## VM Spec

```

apiVersion: kubevirt.io/v1
kind: VirtualMachine
metadata:
  name: vm-fedora
template:
  spec:
    domain:
      devices:
        interfaces:
          - name: defaultnetwork
            masquerade: {}
            # new interface
          - name: dyniface1
            bridge: {}
    networks:
      - name: defaultnetwork
        pod: {}
        # new network
      - name: dyniface1
        multus:
          networkName: attachnet

```

interface state absent

```

apiVersion: kubevirt.io/v1
kind: VirtualMachine
metadata:
  name: vm-fedora
template:
  spec:
    domain:
      devices:
        interfaces:
          - name: defaultnetwork
            masquerade: {}
            # set the interface state to absent
          - name: dyniface1
            state: absent
            bridge: {}
    networks:
      - name: defaultnetwork
        pod: {}
      - name: dyniface1
        multus:
          networkName: attachnet

```



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4.5.4

---

## 4.6 DHCP

|            |        |      |          |      |                     |      |      |      |          |
|------------|--------|------|----------|------|---------------------|------|------|------|----------|
| managedTap | SR-IOV | DPDK | KubeVirt | DHCP | Kube-OVN            | OVN  | DHCP | DHCP | KubeVirt |
| DHCP       | IP     |      | Kube-OVN | DHCP | DHCPv6, IPv6RA, DNS | TFTP | DHCP | DHCP |          |

### ⚠ Warning

1. bridge      KubeVirt    DHCP    Kube-OVN    DHCP    Kube-OVN    DHCP    Kube-OVN    DHCP    managedTap  
bridge      managedTap      managedTap
2.            DHCP      Pod    DHCP

### DHCP

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: sn-dual
spec:
  cidrBlock: "10.0.0.0/24,240e::a00/120"
  default: false
  disableGatewayCheck: true
  disableInterConnection: false
  excludeIps:
    - 10.0.0.1
    - 240e::a01
  gateway: 10.0.0.1,240e::a01
  gatewayNode: ''
  gatewayType: distributed
  natOutgoing: false
  private: false
  protocol: Dual
  provider: ovn
  vpc: vpc-test
  enableDHCP: true
  dhcpV4Options: "lease_time=3600,router=10.0.0.1,server_id=169.254.0.254,server_mac=00:00:00:2E:2F:B8"
  dhcpV6Options: "server_id=00:00:00:2E:2F:C5"
  enableIPv6RA: true
  ipv6RAConfigs: "address_mode=dhcpv6_stateful,max_interval=30,min_interval=5,send_periodic=true"
```

- enableDHCP :      DHCP
- dhcpV4Options , dhcpV6Options :      ovn-nb    DHCP Options      "lease\_time=3600, router=\$ipv4\_gateway, server\_id=169.254.0.254, server\_mac=\$random\_mac"    server\_id=\$random\_mac
- enableIPv6RA :      DHCPv6
- ipv6RAConfigs :      ovn-nb    Logical\_Router\_Port      Logical Router Port      address\_mode=dhcpv6\_stateful, max\_interval=30, min\_interval=5, send\_periodic=true

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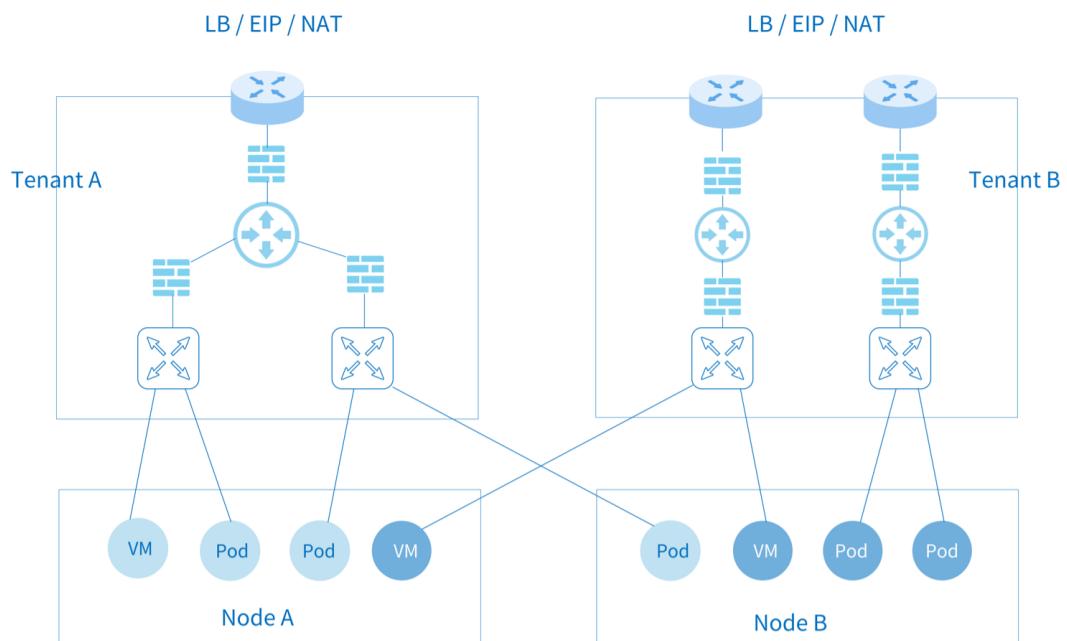
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### 4.6.1

## 5. VPC

### 5.1 VPC

| Kube-OVN | VPC      | VPC | Subnet     | EIP |          |     |            |            |
|----------|----------|-----|------------|-----|----------|-----|------------|------------|
| VPC      | Kube-OVN | VPC | Kubernetes | Pod | NodePort | DNS | Kubernetes | Kubernetes |
| Kube-OVN | VPC      | VPC | VPC        | VPC | VPC      | VPC | VPC        | ACL        |



#### 5.1.1

| Kube-OVN                                     | VPC | OVN | IP | VPC | IP | IP | VPC | OVN | Datapath ID |
|--|-----|-----|----|-----|----|----|-----|-----|-------------|
| Datapath ID<br>Architecture Design Decisions |     |     |    |     |    |    |     |     |             |

#### 5.1.2 VPC

##### VPC

```

kind: Vpc
apiVersion: kubeovn.io/v1
metadata:
  name: test-vpc-1
spec:
  namespaces:
  - ns1
---
kind: Vpc
apiVersion: kubeovn.io/v1
metadata:
  name: test-vpc-2
spec:
  namespaces:
  - ns2
  
```

- namespaces

Namespace

VPC

VPC CIDR:

```

kind: Subnet
apiVersion: kubeovn.io/v1
metadata:
  name: net1
spec:
  vpc: test-vpc-1
  cidrBlock: 10.0.1.0/24
  protocol: IPv4
  namespaces:
    - ns1
---
kind: Subnet
apiVersion: kubeovn.io/v1
metadata:
  name: net2
spec:
  vpc: test-vpc-2
  cidrBlock: 10.0.1.0/24
  protocol: IPv4
  namespaces:
    - ns2
  
```

Namespace Pod:

```

apiVersion: v1
kind: Pod
metadata:
  namespace: ns1
  name: vpc1-pod
spec:
  containers:
    - name: vpc1-pod
      image: docker.io/library/nginx:alpine
---
apiVersion: v1
kind: Pod
metadata:
  namespace: ns2
  name: vpc2-pod
spec:
  containers:
    - name: vpc2-pod
      image: docker.io/library/nginx:alpine
  
```

Pod CIDR VPC Pod

### 5.1.3 VPC

|     |            |     |            |      |
|-----|------------|-----|------------|------|
| VPC | VPC        | VPC | IP SNAT    | DNAT |
| VPC | Multus-CNI |     | multus-cni |      |

**Note**

|                |         |          |                |         |          |         |     |     |
|----------------|---------|----------|----------------|---------|----------|---------|-----|-----|
| VPC            | VPC     |          |                |         |          |         |     |     |
| VPC            | VPC NAT | OVN      | Egress Gateway | VPC NAT | Kube-OVN | VPC NAT | Pod | VPC |
| Macvlan        | Pod     | iptables |                |         |          |         |     |     |
| OVN            | OVN     | NAT      |                | OVN     | BFD      | OVN     | OVN |     |
| Egress Gateway |         | VPC NAT  |                |         |          |         |     |     |

```

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: ovn-vpc-external-network
spec:
  protocol: IPv4
  provider: ovn-vpc-external-network.kube-system
  cidrBlock: 192.168.0.0/24
  gateway: 192.168.0.1 # IP address of the physical gateway
  excludeIps:
  
```

```
- 192.168.0.1..192.168.0.10
---
apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: ovn-vpc-external-network
  namespace: kube-system
spec:
  config: '{
    "cniVersion": "0.3.0",
    "type": "macvlan",
    "master": "eth1",
    "mode": "bridge",
    "ipam": {
      "type": "kube-ovn",
      "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
      "provider": "ovn-vpc-external-network.kube-system"
    }
  }'
          `ipam`       VPC       net1     Kube-OVN     IP
---
apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: ovn-vpc-external-network
  namespace: kube-system
spec:
  config: '{
    "cniVersion": "0.3.0",
    "type": "macvlan",
    "master": "eth1",
    "mode": "bridge"
  }'
```

- |                   |                                       |                             |        |
|-------------------|---------------------------------------|-----------------------------|--------|
| • Subnet          | Macvlan                               | VPC                         | IP     |
| • VPC             | Macvlan                               | NetworkAttachmentDefinition | master |
| • name            |                                       |                             |        |
| Macvlan           | L2/L3                                 | Vlan                        |        |
| 1. OpenStack VM   | PortSecurity                          |                             |        |
| 2. VMware vSwitch | MAC Address Changes, Forged Transmits | Promiscuous Mode Operation  | allow  |
| 3. Hyper-V        | MAC Address Spoofing                  |                             |        |
| 4. AWS GCE        | Mac                                   | Macvlan                     |        |
| 5. Macvlan        | Macvlan                               | VpcNatGateway Pod           | Pod    |
| 6.                | Trunk                                 | Macvlan                     |        |

VPC

```
---  
kind: ConfigMap  
apiVersion: v1  
metadata:  
  name: ovn-vpc-nat-config  
  namespace: kube-system  
data:  
  image: 'docker.io/kubeovn/vpc-nat-gateway:v1.15.0'  
  nodeSelector: |  
    kubernetes.io/hostname: kube-ovn-control-plane  
---  
kind: ConfigMap  
apiVersion: v1  
metadata:  
  name: ovn-vpc-nat-gw-config  
  namespace: kube-system  
data:  
  enable_vpc_nat_gw: 'true'
```

- `image`: Pod
  - `enable-vpc-nat-gw` VPC

**VPC**

```

kind: VpcNatGateway
apiVersion: kubeovn.io/v1
metadata:
  name: gw1
spec:
  vpc: test-vpc-1
  subnet: net1
  lanIp: 10.0.1.254
  selector:
    - "kubernetes.io/hostname: kube-ovn-worker"
    - "kubernetes.io/os: linux"
  externalSubnets:
    - ovn-vpc-external-network
  noDefaultEIP: false

```

- vpc VpcNatGateway VPC
- subnet VPC Subnet VPC Pod lanIp
- lanIp subnet IP VPC Pod IP VPC VpcNatGateway nextHopIP lanIp
- selector VpcNatGateway Pod Kubernetes NodeSelector
- externalSubnets VPC ovn-vpc-external-network
- noDefaultEIP VPC EIP false v1.15 BGP true Underlay

- tolerations VPC
- affinity VPC Pod

**VPC-NAT-GW**

1. nat gw pod net1 arp ping eip arp ping

**EIP**

EIP IP VPC DNAT SNAT IP  
EIP

```

kind: IptablesEIP
apiVersion: kubeovn.io/v1
metadata:
  name: eip-random
spec:
  natGwDp: gw1

```

**EIP**

```

kind: IptablesEIP
apiVersion: kubeovn.io/v1
metadata:
  name: eip-static
spec:
  natGwDp: gw1
  v4ip: 192.168.0.100

```

**EIP**

```

kind: IptablesEIP
apiVersion: kubeovn.io/v1
metadata:
  name: eip-random
spec:
  natGwDp: gw1
  externalSubnet: ovn-vpc-external-network

```

- externalSubnet EIP ovn-vpc-external-network VPC externalSubnets

## DNAT

DNAT                  EIP                  VPC                  IP

```
kind: IptablesEIP
apiVersion: kubeovn.io/v1
metadata:
  name: eipd01
spec:
  natGwDp: gw1

---
kind: IptablesDnatRule
apiVersion: kubeovn.io/v1
metadata:
  name: dnat01
spec:
  eip:
    eipd01
    externalPort: '8888'
    internalIp: 10.0.1.10
    internalPort: '80'
    protocol: tcp
```

## SNAT

```
---
```

```
kind: IptablesEIP
apiVersion: kubeovn.io/v1
metadata:
  name: eips01
spec:
  natGwDp: gw1
---
kind: IptablesSnatRule
apiVersion: kubeovn.io/v1
metadata:
  name: snat01
spec:
  eip: eips01
  internalCIDR: 10.0.1.0/
```

IP

IP VPC IP EIP EIP VPC IP VPC IP SNAT EIP

```
---
```

```
kind: IptablesEIP
apiVersion: kubeovn.io/v1
metadata:
  name: eipf01
spec:
  natGwDp: gw1
```

```
---
```

```
kind: IptablesFIPRule
apiVersion: kubeovn.io/v1
metadata:
  name: fip01
spec:
  eip: eipf01
  internalIn: 10.0.1.5
```

5.1.4

```
kind: Vpc
apiVersion: kubeovn.io/v1
metadata:
  name: test-vpc-1
spec:
  staticRoutes:
    - cidr: 0.0.0.0/0
      nextHopIP: 10.0.1.254
      policy: policyDst
```

```
- cidr: 172.31.0.0/24
  nextHopIP: 10.0.1.253
  policy: policySrc
  routeTable: "rtb1"
```

- policy: policyDst policySrc
- CIDR
- routeTable:

OVN

Logical Router Policy

```
kind: Vpc
apiVersion: kubeovn.io/v1
metadata:
  name: test-vpc-1
spec:
  policyRoutes:
    - action: drop
      match: ip4.src==10.0.1.0/24 && ip4.dst==10.0.1.250
      priority: 11
    - action: reroute
      match: ip4.src==10.0.1.0/24
      nextHopIP: 10.0.1.252
      priority: 10
```

## 5.1.5

|            |         |            |         |    |     |     |
|------------|---------|------------|---------|----|-----|-----|
| Kubernetes | Service | Kubernetes | Service | IP | VPC | VPC |
| Kubernetes | Service |            |         |    |     |     |

Kube-OVN SwitchLBRule

SwitchLBRule

```
apiVersion: kubeovn.io/v1
kind: SwitchLBRule
metadata:
  name: cjh-slr-nginx
spec:
  vip: 1.1.1.1
  sessionAffinity: ClientIP
  namespace: default
  selector:
    - app: nginx
  ports:
    - name: dns
      port: 8888
      targetPort: 80
      protocol: TCP
```

- vip
- namespace Pod Namespace
- sessionAffinity Service sessionAffinity
- selector Service selector
- ports Service port

```
# kubectl get slr
NAME          VIP        PORT(S)           SERVICE          AGE
vpc-dns-test-cjh2  10.96.0.3  53/UDP, 53/TCP, 9153/TCP  kube-system/slr-vpc-dns-test-cjh2  88m
```

## 5.1.6 vpc-dns

|     |     |     |     |         |     |         |         |          |         |
|-----|-----|-----|-----|---------|-----|---------|---------|----------|---------|
| VPC | VPC | VPC | Pod | coredns | VPC | CoreDNS | Service | Kube-OVN | vpc-dns |
|-----|-----|-----|-----|---------|-----|---------|---------|----------|---------|

```

apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: ovn-nad
  namespace: default
spec:
  config: '{
    "cniVersion": "0.3.0",
    "type": "kube-ovn",
    "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
    "provider": "ovn-nad.default.ovn"
  }'

```

## ovn-default provider

```
ovn-default provider nad provider ovn-nad.default.ovn
```

```

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: ovn-default
spec:
  cidrBlock: 10.16.0.0/16
  default: true
  disableGatewayCheck: false
  disableInterConnection: false
  enableDHCP: false
  enableIPv6RA: false
  excludeIps:
  - 10.16.0.1
  gateway: 10.16.0.1
  gatewayType: distributed
  logicalGateway: false
  natOutgoing: true
  private: false
  protocol: IPv4
  provider: ovn-nad.default.ovn
  vpc: ovn-cluster

```

## vpc-dns ConfigMap

```
kube-system configmap vpc-dns vpc-dns
```

```

apiVersion: v1
kind: ConfigMap
metadata:
  name: vpc-dns-config
  namespace: kube-system
data:
  coredns-vip: 10.96.0.3
  enable-vpc-dns: "true"
  nad-name: ovn-nad
  nad-provider: ovn-nad.default.ovn

```

- enable-vpc-dns true false true
- coredns-image dns coredns
- coredns-template dns URL yamls/coredns-template.yaml
- coredns-vip coredns lb vip
- nad-name network-attachment-definitions
- nad-provider provider
- k8s-service-host coredns k8s apiserver ip
- k8s-service-port coredns k8s apiserver port

## vpc-dns

```

apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRole
metadata:
  labels:
    kubernetes.io/bootstrapping: rbac-defaults
  name: system:vpc-dns

```

```

rules:
- apiGroups:
  - ""
resources:
- endpoints
- services
- pods
- namespaces
verbs:
- list
- watch
- apiGroups:
  - discovery.k8s.io
resources:
- endpointslices
verbs:
- list
- watch
---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
annotations:
  rbac.authorization.kubernetes.io/autoupdate: "true"
labels:
  kubernetes.io/bootstrapping: rbac-defaults
name: vpc-dns
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: ClusterRole
  name: system:vpc-dns
subjects:
- kind: ServiceAccount
  name: vpc-dns
  namespace: kube-system
---
apiVersion: v1
kind: ServiceAccount
metadata:
  name: vpc-dns
  namespace: kube-system
---
apiVersion: v1
kind: ConfigMap
metadata:
  name: vpc-dns-corefile
  namespace: kube-system
data:
Corefile: |
.:53 {
  errors
  health {
    lameduck 5s
  }
  ready
  kubernetes cluster.local in-addr.arpa ip6.arpa {
    pods insecure
    fallthrough in-addr.arpa ip6.arpa
  }
  prometheus :9153
  forward . /etc/resolv.conf {
    prefer_udp
  }
  cache 30
  loop
  reload
  loadbalance
}

```

## vpc-dns

```

kind: VpcDns
apiVersion: kubeovn.io/v1
metadata:
  name: test-cjh1
spec:
  vpc: cjh-vpc-1
  subnet: cjh-subnet-1

```

- vpc dns vpc
- subnet dns

```
[root@hci-dev-mst-1 kubeovn]# kubectl get vpc-dns
NAME      ACTIVE   VPC      SUBNET

```

```
test-cjh1  false  cjh-vpc-1  cjh-subnet-1
test-cjh2  true   cjh-vpc-1  cjh-subnet-2
```

- ACTIVE: true dns false
- VPC DNS
- VPC vpc-dns VPC subnet vpc-dns true false
- true vpc-dns false vpc-dns

## 5.1.7

VPC VPC

```
kind: Vpc
apiVersion: kubeovn.io/v1
metadata:
  name: test-vpc-1
spec:
  namespaces:
  - ns1
  defaultSubnet: test
```

- defaultSubnet VPC
- |           |                                  |                                  |     |
|-----------|----------------------------------|----------------------------------|-----|
| Namespace | ovn.kubernetes.io/logical_switch | ovn.kubernetes.io/logical_switch | Pod |
|-----------|----------------------------------|----------------------------------|-----|

### VPC Pod livenessProbe readinessProbe

VPC Pod kubelet VPC Pod Kube-OVN TProxy kubelet VPC Pod

DaemonSet kube-ovn-cni --enable-tproxy=true

```
spec:
  template:
    spec:
      containers:
      - args:
        - --enable-tproxy=true
```

1. VPC Pod IP

2. tcpSocket httpGet

[PDF](#)

[Slack](#)

[Support](#)

⌚2025 12 9

⌚2022 5 24



## 5.1.8

## 5.2 VPC Egress Gateway

| <b>Note</b>    |         |          |                |         |          |         |     |     |  |
|----------------|---------|----------|----------------|---------|----------|---------|-----|-----|--|
| VPC            | VPC     |          |                |         |          |         |     |     |  |
| VPC            | VPC NAT | OVN      | Egress Gateway | VPC NAT | Kube-OVN | VPC NAT | Pod | VPC |  |
| Macvlan        | Pod     | iptables |                |         |          |         |     |     |  |
| OVN            | OVN     | NAT      |                | OVN     | BFD      | OVN     | OVN |     |  |
| Egress Gateway | VPC NAT |          |                |         |          |         |     |     |  |

VPC Egress Gateway      VPC      VPC      Pod

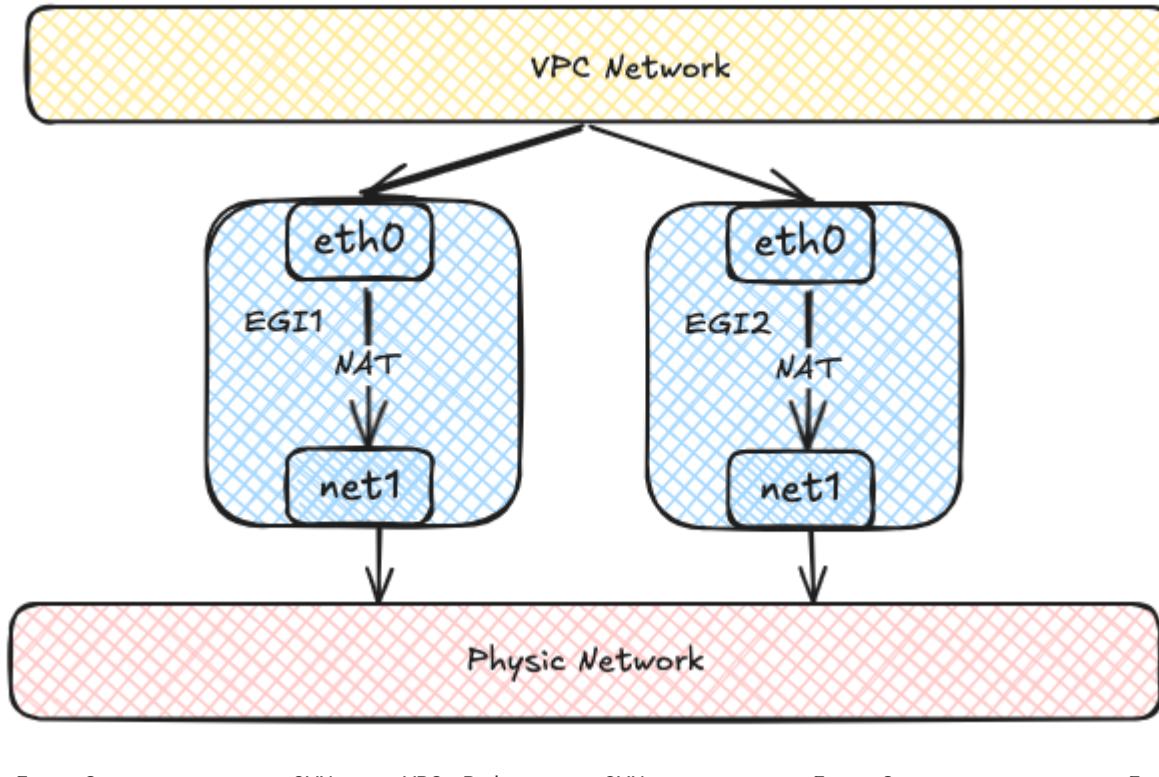
- ECMP Active-Active
- BFD <1s
- IPv6
- Namespace Pod
- Node Egress Gateway

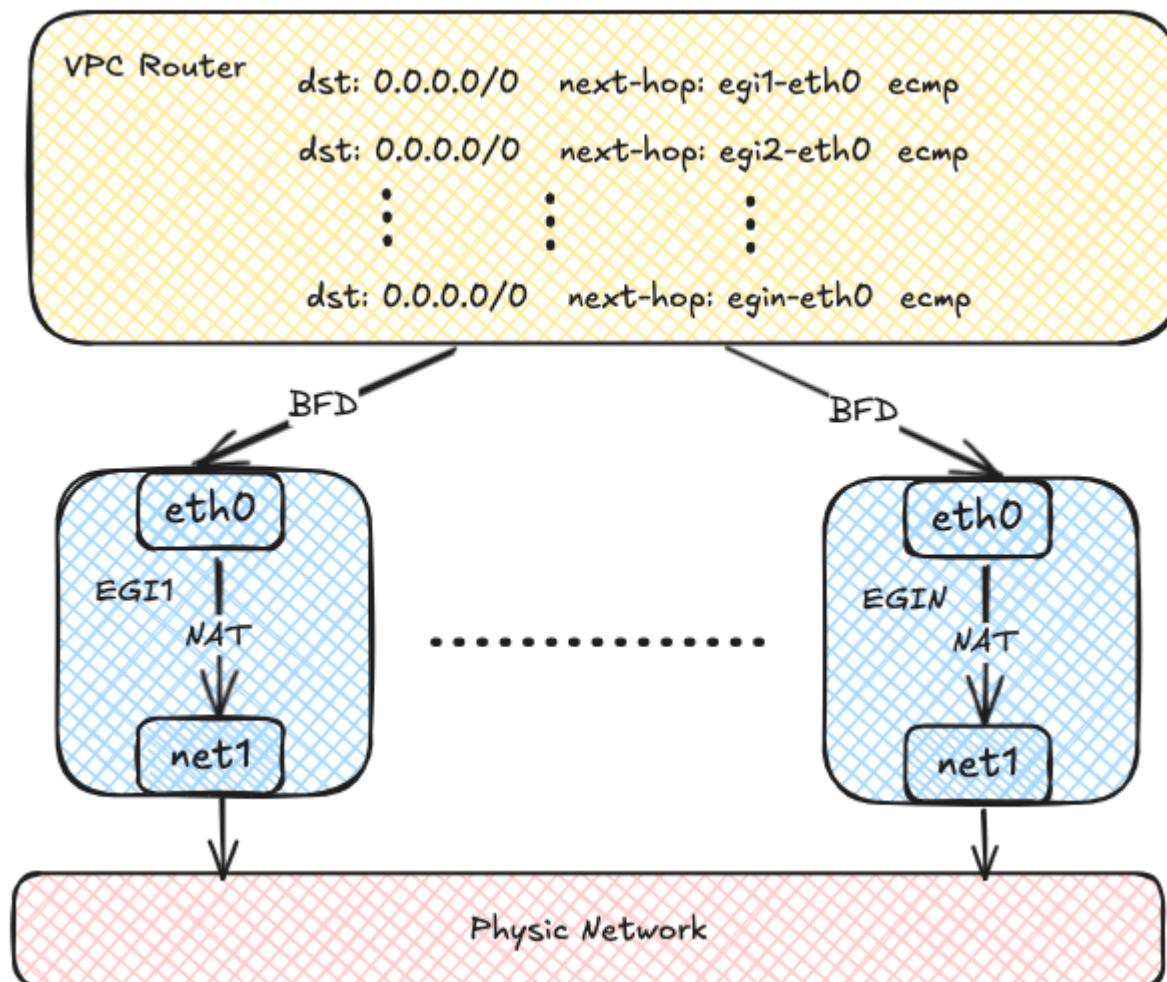
VPC Egress Gateway

- Macvlan [Underlay](#)
- Gateway Egress IP
- SNAT EIP DNAT
- 

### 5.2.1

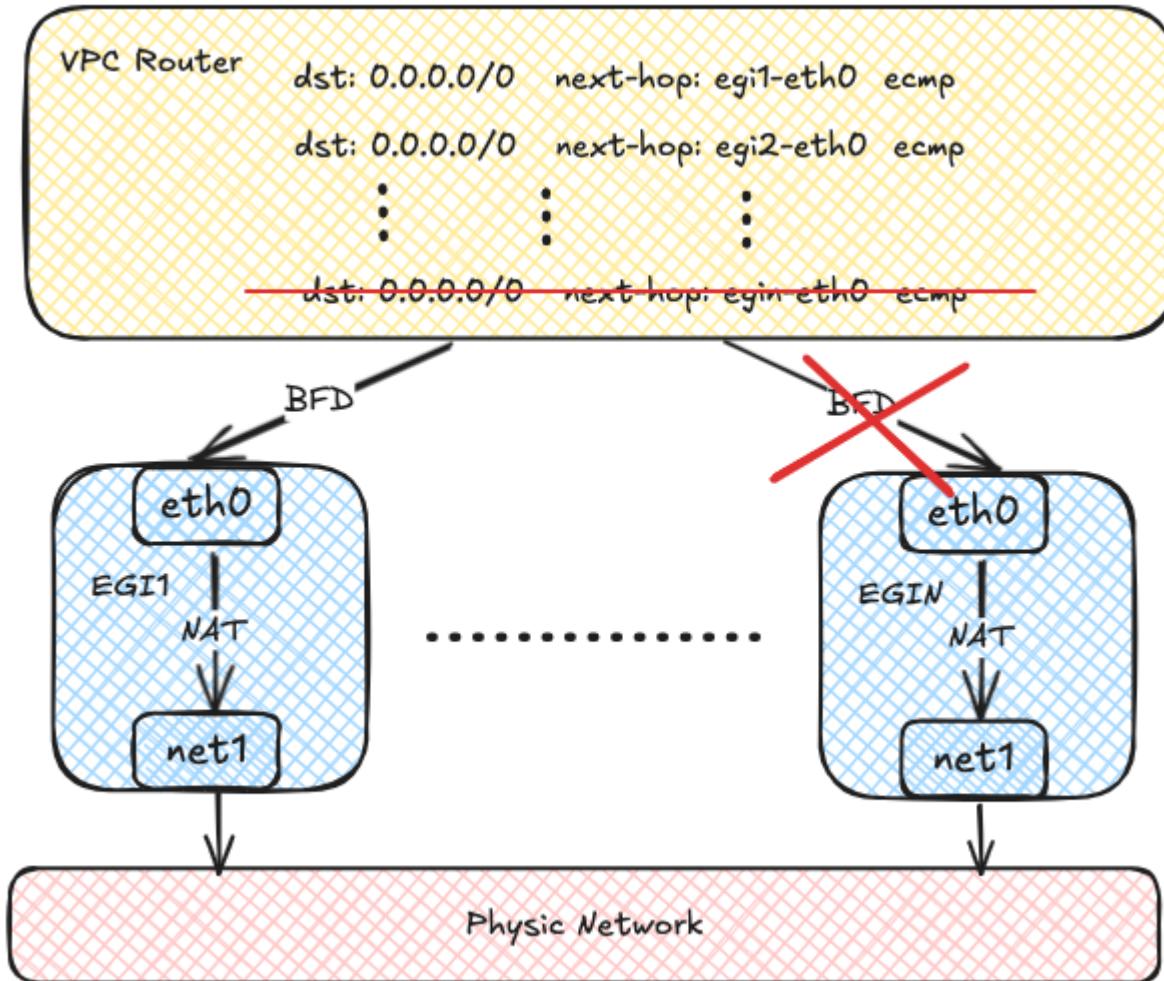
|                |     |     |     |         |                |     |
|----------------|-----|-----|-----|---------|----------------|-----|
| Egress Gateway | Pod | Pod | VPC | Macvlan | Egress Gateway | NAT |
|----------------|-----|-----|-----|---------|----------------|-----|





OVN   BFD      Egress Gateway

Egress Gateway      OVN



### 5.2.2

|                    |                 |            |
|--------------------|-----------------|------------|
| VPC Egress Gateway | VPC NAT Gateway | Multus-CNI |
|                    |                 |            |
| VPC Egress Gateway | ConfigMap       |            |

### 5.2.3

#### NetworkAttachmentDefinition

|                    |     |                             |         |          |      |
|--------------------|-----|-----------------------------|---------|----------|------|
| VPC Egress Gateway | VPC | NetworkAttachmentDefinition | macvlan | Kube-OVN | IPAM |
|--------------------|-----|-----------------------------|---------|----------|------|

```

apiVersion: k8s.cni.cncf.io/v1
kind: NetworkAttachmentDefinition
metadata:
  name: eth1
  namespace: default
spec:
  config: '{
    "cniVersion": "0.3.0",
    "type": "macvlan",
    "master": "eth1",
    "mode": "bridge",
    "ipam": {
      "type": "kube-ovn",
      "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
      "provider": "eth1.default"
    }
  }'
---
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: macvlan1

```

```
spec:
  protocol: IPv4
  provider: eth1.default
  cidrBlock: 172.17.0.0/16
  gateway: 172.17.0.1
  excludeIps:
    - 172.17.0.0..172.17.0.10
```

CNI NetworkAttachmentDefinition VPC Egress Gateway

## VPC Egress Gateway

### VPC Egress Gateway

```
apiVersion: kubeovn.io/v1
kind: VpcEgressGateway
metadata:
  name: gateway1
  namespace: default
spec:
  vpc: ovn-cluster
  replicas: 1
  externalSubnet: macvlan1
  policies:
    - snat: true
      subnets:
        - ovn-default
```

| default  | VPC | ovn-cluster | gateway1 | VPC Egress Gateway | ovn-cluster | ovn-default | 10.16.0.0/16 | Pod  |
|----------|-----|-------------|----------|--------------------|-------------|-------------|--------------|------|
| macvlan1 |     |             |          |                    |             |             |              | SNAT |

### VPC Egress Gateway

```
$ kubectl get veg gateway1
NAME      VPC      REPLICAS   BFD ENABLED   EXTERNAL SUBNET   PHASE   READY   AGE
gateway1  ovn-cluster  1          false        macvlan1       Completed  true    13s
```

```
kubectl get veg gateway1 -o wide
NAME      VPC      REPLICAS   BFD ENABLED   EXTERNAL SUBNET   PHASE   READY   INTERNAL IPS   EXTERNAL IPS   WORKING NODES   AGE
gateway1  ovn-cluster  1          false        macvlan1       Completed  true    ["10.16.0.12"]  ["172.17.0.11"]  ["kube-ovn-worker"]  82s
```

```
$ kubectl get deployment -l ovn.kubernetes.io/vpc-egress-gateway=gateway1
NAME      READY   UP-TO-DATE   AVAILABLE   AGE
gateway1  1/1     1           1           4m40s
```

```
$ kubectl get pod -l ovn.kubernetes.io/vpc-egress-gateway=gateway1 -o wide
NAME          READY   STATUS   RESTARTS   AGE   IP           NODE   NOMINATED NODE   READINESS GATES
gateway1-b9f8b4448-761hm  1/1     Running   0        4m48s  10.16.0.12  kube-ovn-worker  <none>  <none>
```

### Pod IP iptables

```
$ kubectl exec gateway1-b9f8b4448-761hm -c gateway -- ip address show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
  link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
  inet 127.0.0.1/8 scope host lo
    valid_lft forever preferred_lft forever
  inet6 ::1/128 scope host
    valid_lft forever preferred_lft forever
2: net1@if13: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
  link/ether 62:d8:71:90:7b:86 brd ff:ff:ff:ff:ff:ff link-netnsid 0
  inet 172.17.0.11/16 brd 172.17.255.255 scope global net1
    valid_lft forever preferred_lft forever
  inet6 fe80::60d8:71ff:fe90:7b86/64 scope link
    valid_lft forever preferred_lft forever
17: eth0@if18: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1400 qdisc noqueue state UP group default
  link/ether 36:7c:6b:c7:82:6b brd ff:ff:ff:ff:ff:ff link-netnsid 0
  inet 10.16.0.12/16 brd 10.16.255.255 scope global eth0
    valid_lft forever preferred_lft forever
  inet6 fe80::347c:6bff:fec7:826b/64 scope link
    valid_lft forever preferred_lft forever
```

```
$ kubectl exec gateway1-b9f8b4448-761hm -c gateway -- ip route show
default via 172.17.0.1 dev net1
10.16.0.0/16 dev eth0 proto kernel scope link src 10.16.0.12
```

```
172.17.0.0/16 dev net1 proto kernel scope link src 172.17.0.11

$ kubectl exec gateway1-b9f8b4448-76lhm -c gateway -- iptables -t nat -S
-P PREROUTING ACCEPT
-P INPUT ACCEPT
-P OUTPUT ACCEPT
-P POSTROUTING ACCEPT
-A POSTROUTING -s 10.16.0.0/16 -j MASQUERADE --random-fu
```

## Gateway Pod

```
$ kubectl exec -ti gateway1-b9f8b4448-76lhm -c gateway -- bash
nobody@gateway1-b9f8b4448-76lhm:/kube-ovn$ tcpdump -i any -nnve icmp and host 172.17.0.1
tcpdump: data link type LINUX_SLL2
tcpdump: listening on any, link-type LINUX_SLL2 (Linux cooked v2), snapshot length 262144 bytes
06:50:58.936528 eth0 In ifindex 17 92:26:b8:9e:f2:1c ethertype IPv4 (0x0800), length 104: (tos 0x0, ttl 63, id 30481, offset 0, flags [DF], proto ICMP (1), length 84)
    10.16.0.9 > 172.17.0.1: ICMP echo request, id 37989, seq 0, length 64
06:50:58.936574 net1 Out ifindex 2 62:d8:71:90:7b:86 ethertype IPv4 (0x0800), length 104: (tos 0x0, ttl 62, id 30481, offset 0, flags [DF], proto ICMP (1), length 84)
    172.17.0.11 > 172.17.0.1: ICMP echo request, id 39449, seq 0, length 64
06:50:58.936613 net1 In ifindex 2 02:42:39:79:7f:08 ethertype IPv4 (0x0800), length 104: (tos 0x0, ttl 64, id 26701, offset 0, flags [none], proto ICMP (1), length 84)
    172.17.0.1 > 172.17.0.11: ICMP echo reply, id 39449, seq 0, length 64
06:50:58.936621 eth0 Out ifindex 17 36:7c:6b:c7:82:6b ethertype IPv4 (0x0800), length 104: (tos 0x0, ttl 63, id 26701, offset 0, flags [none], proto ICMP (1), length 84)
    172.17.0.1 > 10.16.0.9: ICMP echo reply, id 37989, seq 0, length 64
```

## OVN Logical Router

### VPC

```
$ kubectl ko nbctl lr-policy-list ovn-cluster
Routing Policies
 31000          ip4.dst == 10.16.0.0/16      allow
 31000          ip4.dst == 100.64.0.0/16     allow
 30000          ip4.dst == 172.18.0.2       reroute   100.64.0.3
 30000          ip4.dst == 172.18.0.3       reroute   100.64.0.2
 30000          ip4.dst == 172.18.0.4       reroute   100.64.0.4
 29100          ip4.src == 10.16.0.0/16      reroute   10.16.0.12
 29000 ip4.src == $ovn.default.kube.ovn.control_plane_ip4  reroute   100.64.0.2
 29000          ip4.src == $ovn.default.kube.ovn.worker2_ip4  reroute   100.64.0.4
 29000          ip4.src == $ovn.default.kube.ovn.worker_ip4   reroute   100.64.0.3
```

```
.spec.replicas
```

```
$ kubectl scale veg gateway1 --replicas=2
vpceregressgateway.kubeovn.io/gateway1 scaled

$ kubectl get veg gateway1
NAME      VPC      REPLICAS      BFD ENABLED      EXTERNAL SUBNET      PHASE      READY      AGE
gateway1  ovn-cluster  2           false           macvlan           Completed  true       39m

$ kubectl get pod -l ovn.kubernetes.io/vpc-egress-gateway=gateway1 -o wide
NAME                  READY   STATUS   RESTARTS   AGE      IP           NODE      NOMINATED NODE   READINESS GATES
gateway1-b9f8b4448-76lhm 1/1     Running   0          40m  10.16.0.12  kube-ovn-worker  <none>        <none>
gateway1-b9f8b4448-zd4dl 1/1     Running   0          64s  10.16.0.13  kube-ovn-worker2 <none>        <none>

$ kubectl ko nbctl lr-policy-list ovn-cluster
Routing Policies
 31000          ip4.dst == 10.16.0.0/16      allow
 31000          ip4.dst == 100.64.0.0/16     allow
 30000          ip4.dst == 172.18.0.2       reroute   100.64.0.3
 30000          ip4.dst == 172.18.0.3       reroute   100.64.0.2
 30000          ip4.dst == 172.18.0.4       reroute   100.64.0.4
 29100          ip4.src == 10.16.0.0/16      reroute   10.16.0.12, 10.16.0.13
 29000 ip4.src == $ovn.default.kube.ovn.control_plane_ip4  reroute   100.64.0.2
 29000          ip4.src == $ovn.default.kube.ovn.worker2_ip4  reroute   100.64.0.4
 29000          ip4.src == $ovn.default.kube.ovn.worker_ip4   reroute   100.64.0.3
```

## Egress Gateway IP

| externalIPs | nodeSelector | Egress Gateway Pods | Egress IP |
|-------------|--------------|---------------------|-----------|
|             |              |                     |           |

```
apiVersion: kubeovn.io/v1
kind: VpcEgressGateway
metadata:
  name: gateway1
  namespace: default
spec:
  vpc: ovn-cluster
  replicas: 2
  externalSubnet: macvlan1
  policies:
    - snat: true
      subnets:
        - ovn-default
```

```

externalIPs:
  - 172.17.0.10
  - 172.17.0.11
nodeSelector:
  - matchLabels:
    kubernetes.io/hostname: kube-ovn-worker

```

**BFD**

BFD      VPC    BFD LRP      VPC      BFD Port

```

apiVersion: kubeovn.io/v1
kind: Vpc
metadata:
  name: vpc1
spec:
  bfdPort:
    enabled: true
    ip: 10.255.255.255
---
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: subnet1
spec:
  vpc: vpc1
  protocol: IPv4
  cidrBlock: 192.168.0.0/24

```

BFD Port      OVN LR      BFD    LRP

```
$ kubectl get vpc
router 0c1d1e8f-4c86-4d96-88b2-c4171c7ff824 (vpc1)
  port bfd@vpc1
    mac: "8e:51:4b:16:3c:98"
    networks: ["10.255.255.255"]
  port vpc1-subnet1
    mac: "de:c9:5c:38:7a:61"
    networks: ["192.168.0.1/24"]
```

VPC Egress Gateway    .spec.bfd.enabled      true

```

apiVersion: kubeovn.io/v1
kind: VpcEgressGateway
metadata:
  name: gateway2
  namespace: default
spec:
  vpc: vpc1
  replicas: 2
  internalSubnet: subnet1
  externalSubnet: macvlan
  bfd:
    enabled: true
  policies:
    - snat: true
      ipBlocks:
        - 192.168.0.0/24

```

VPC Egress Gateway

```
$ kubectl get veg gateway2 -o wide
NAME      VPC      REPLICAS   BFD ENABLED   EXTERNAL SUBNET   PHASE      READY   INTERNAL IPS                               EXTERNAL IPs          WORKING
NODES          AGE
gateway2   vpc1     2          true        macvlan           Completed   true    ["192.168.0.2", "192.168.0.3"]   ["172.17.0.13", "172.17.0.14"]   ["kube-ovn-worker", "kube-ovn-worker2"]   58s

$ kubectl get pod -l ovn.kubernetes.io/vpc-egress-gateway=gateway2 -o wide
NAME          READY   STATUS    RESTARTS   AGE   IP           NODE   NOMINATED NODE   READINESS GATES
gateway2-fcc6b8b87-8lgvx  1/1    Running   0          2m18s  192.168.0.3  kube-ovn-worker2  <none>  <none>
gateway2-fcc6b8b87-wmww6  1/1    Running   0          2m18s  192.168.0.2  kube-ovn-worker   <none>  <none>

$ kubectl get lr-route-list vpc1
IPv4 Routes
Route Table <main>:
  192.168.0.0/24      192.168.0.2 src-ip ecmp ecmp-symmetric-reply bfd
  192.168.0.0/24      192.168.0.3 src-ip ecmp ecmp-symmetric-reply bfd

$ kubectl get bfd
_uuid          : 223ede10-9169-4c7d-9524-a546e24bfab5
detect_mult    : 3
dst_ip         : "192.168.0.2"
external_ids   : {uf="4", vendor=kube-ovn, vpc-egress-gateway="default/gateway2"}
logical_port   : "bfd@vpc1"
min_rx         : 1000
```

```

min_tx      : 1000
options     : {}
status      : up

_uuid       : b050c75e-2462-470b-b89c-7bd38889b758
detect_mult : 3
dst_ip      : "192.168.0.3"
external_ids: {pf="4", vendor=kube-ovn, vpc-egress-gateway="default/gateway2"}
logical_port: "bfd@vpc1"
min_rx      : 1000
min_tx      : 1000
options     : {}
status      : up

```

## Pod BFD

```

$ kubectl exec gateway2-fcc6b8b87-8lgvx -c bfdd -- bfdd-control status
There are 1 sessions:
Session 1
id=1 local=192.168.0.3 (p) remote=10.255.255.255 state=Up

$ kubectl exec gateway2-fcc6b8b87-wmww6 -c bfdd -- bfdd-control status
There are 1 sessions:
Session 1
id=1 local=192.168.0.2 (p) remote=10.255.255.255 state=Up

```

## VPC BFD PORT

|                               |              |   | false   | BFD Port  | true            |
|-------------------------------|--------------|---|---|---|-----------------|
| enabled                       | boolean      |   |   |   |                 |
| ip                            | string       | - | BFD Port  | IP  | 169.255.255.252 |
|                               |              |   |   | IPv6  | 169.255.255.251 |
| nodeSelector                  | object       | - | BFD Port  | BFD Port  | -               |
|                               |              |   |   | OVN HA Chassis<br>Group Active/<br>Backup<br>Active<br>nodeSelector<br>Kube-OVN |                 |
|                               |              |   | kubectl ko nbctl<br>list<br>ha_chassis_group<br>OVN HA<br>Chassis Group |   |                 |
| nodeSelector.matchLabels      | dict/map     | - |   |   | -               |
| nodeSelector.matchExpressions | object array | - |   |   | -               |

## VPC EGRESS GATEWAY

## Spec

|                |               |         |                       |  |                            |
|----------------|---------------|---------|-----------------------|--|----------------------------|
| vpc            | string        | VPC     | ovn-cluster           | VPC  | vpc1                       |
| replicas       | integer/int32 | 1       |                       |  | 2                          |
| prefix         | string        | -       |                       | Deployment   | veg-                       |
| image          | string        | -       |                       | Deployment   | docker.io/kubeovn/kube-ovn |
| internalSubnet | string        | VPC     |                       | VPC  | subnet1                    |
| externalSubnet | string        | -       |                       |  | ext1                       |
| internalIPs    | string array  | -       | VPC<br>IPv6           | IP<br>IP   | 10.16.0.101 / fd00::11 / 1 |
|                |               |         | <replicas> + 1<br>Pod |  |                            |
| externalIPs    | string array  | -       | IPv6                  | IP<br>IP   | 10.16.0.101 / fd00::11 / 1 |
|                |               |         | <replicas> + 1<br>Pod |  |                            |
| bfd            | object        | -       |                       | BFD  | -                          |
| policies       | object array  | -       |                       | Egress<br>selectors  | -                          |
| selectors      | object array  | -       |                       | Namespace<br>Selector Pod<br>Selector Egress<br>Pod<br>SNAT/<br>MASQUERADE<br>policies | -                          |
| nodeSelector   | object array  | -       |                       | Deployment/Pod   | -                          |
| trafficPolicy  | string        | Cluster |                       | Cluster /<br>Local BFD<br>Local Egress<br>VPC  | Local                      |
|                |               |         |                       | Egress Gateway<br>VPC Egress<br>Gateway<br>Egress                                      |                            |

**BFD**

|                         |                            |                    |                             |                   |
|-------------------------|----------------------------|--------------------|-----------------------------|-------------------|
| <code>enabled</code>    | <code>boolean</code>       | <code>false</code> | <code>BFD</code>            | <code>true</code> |
| <code>minRX</code>      | <code>integer/int32</code> | <code>1000</code>  | <code>BFD minRX</code>      | <code>500</code>  |
| <code>minTX</code>      | <code>integer/int32</code> | <code>1000</code>  | <code>BFD minTX</code>      | <code>500</code>  |
| <code>multiplier</code> | <code>integer/int32</code> | <code>3</code>     | <code>BFD multiplier</code> | <code>1</code>    |

**Egress**

|                       |                           |                    |                              |   |
|-----------------------|---------------------------|--------------------|------------------------------|---|
| <code>snat</code>     | <code>boolean</code>      | <code>false</code> | <code>SNAT/MASQUERADE</code> | <code>true</code>                         |
| <code>ipBlocks</code> | <code>string array</code> | <code>-</code>     | <code>Gateway IP</code>      | <code>192.168.0.1 / 192.168.0.0/24</code> |
| <code>subnets</code>  | <code>string array</code> | <code>-</code>     | <code>Gateway VPC</code>     | <code>subnet1 IPv6</code>                 |

**Selectors**

|   |                           |                |                        |                |
|---|---------------------------|----------------|------------------------|----------------|
| <code>namespaceSelector</code>                  | <code>object</code>       | <code>-</code> | <code>Namespace</code> | <code>-</code> |
| <code>podSelector</code>                        | <code>object</code>       | <code>-</code> | <code>Pod</code>       | <code>-</code> |
| <code>namespaceSelector.matchLabels</code>      | <code>dict/map</code>     | <code>-</code> | <code>Namespace</code> | <code>-</code> |
| <code>namespaceSelector.matchExpressions</code> | <code>object array</code> | <code>-</code> | <code>Pod</code>       | <code>-</code> |
| <code>podSelector.matchLabels</code>            | <code>dict/map</code>     | <code>-</code> | <code>Pod</code>       | <code>-</code> |
| <code>podSelector.matchExpressions</code>       | <code>object array</code> | <code>-</code> | <code>Pod</code>       | <code>-</code> |

|                               |                           |                |                |
|-------------------------------|---------------------------|----------------|----------------|
| <code>matchLabels</code>      | <code>dict/map</code>     | <code>-</code> | <code>-</code> |
| <code>matchExpressions</code> | <code>object array</code> | <code>-</code> | <code>-</code> |
| <code>matchFields</code>      | <code>object array</code> | <code>-</code> | <code>-</code> |

## Status

|                     |              |         |                                  |
|---------------------|--------------|---------|----------------------------------|
| ready               | boolean      | Gateway | true                             |
| phase               | string       | Gateway | Pending / Processing / Completed |
| internalIPs         | string array | VPC     | IP                               |
| externalIPs         | string array | IP      | -                                |
| workload            | object       |         | -                                |
| workload.apiVersion | string       | API     | apps/v1                          |
| workload.kind       | string       |         | Deployment                       |
| workload.name       | string       |         | gateway1                         |
| workload.nodes      | string array |         | -                                |
| conditions          | object array | -       | -                                |

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5.2.4

## 5.3 VPC QoS

Kube-OVN    QoS Policy CRD    VPC

### 5.3.1 EIP QoS

|     |       |   |              |            |     |            |     |
|-----|-------|---|--------------|------------|-----|------------|-----|
| EIP | 1Mbps | 1 | shared=false | QoS Policy | EIP | QoS Policy | QoS |
|-----|-------|---|--------------|------------|-----|------------|-----|

QoS Policy

```
apiVersion: kubeovn.io/v1
kind: QoS Policy
metadata:
  name: qos-eip-example
spec:
  shared: false
  bindingType: EIP
  bandwidthLimitRules:
    - name: eip-ingress
      rateMax: "1" # Mbps
      burstMax: "1" # Mbps
      priority: 1
      direction: ingress
    - name: eip-egress
      rateMax: "1" # Mbps
      burstMax: "1" # Mbps
      priority: 1
      direction: egress
```

Iptables EIP

```
kind: IptablesEIP
apiVersion: kubeovn.io/v1
metadata:
  name: eip-1
spec:
  natGwDp: gw1
  qosPolicy: qos-eip-example
```

.spec.qosPolicy

### 5.3.2 QoS EIP

|       |     |     |
|-------|-----|-----|
| label | qos | eip |
|-------|-----|-----|

```
# kubectl get eip -l ovn.kubernetes.io/qos=qos-eip-example
NAME     IP          MAC        NAT      NATGWDP   READY
eip-1   172.18.11.24  00:00:00:34:41:0B  fip    gw1      true
```

### 5.3.3 VPC NATGW net1 QoS

|           |      |        |   |             |            |            |
|-----------|------|--------|---|-------------|------------|------------|
| VPC NATGW | net1 | 10Mbps | 3 | shared=true | QoS Policy | QoS Policy |
|-----------|------|--------|---|-------------|------------|------------|

QoS Policy

```
apiVersion: kubeovn.io/v1
kind: QoS Policy
metadata:
  name: qos-natgw-example
spec:
  shared: true
  bindingType: NATGW
  bandwidthLimitRules:
    - name: net1-ingress
      interface: net1
      rateMax: "10" # Mbps
      burstMax: "10" # Mbps
      priority: 3
      direction: ingress
    - name: net1-egress
      interface: net1
      rateMax: "10" # Mbps
      burstMax: "10" # Mbps
```

```
priority: 3
direction: egress
```

### VpcNatGateway

```
kind: VpcNatGateway
apiVersion: kubeovn.io/v1
metadata:
  name: gw1
spec:
  vpc: test-vpc-1
  subnet: net1
  lanIp: 10.0.1.254
  qosPolicy: qos-natgw-example
  selector:
    - "kubernetes.io/hostname: kube-ovn-worker"
    - "kubernetes.io/os: linux"
```

```
.spec.qosPolicy
```

## 5.3.4 net1 QoS

| net1 | 5Mbps | 2 | shared=true | QoS Policy | QoS Policy |
|------|-------|---|-------------|------------|------------|
|------|-------|---|-------------|------------|------------|

### QoS Policy

```
apiVersion: kubeovn.io/v1
kind: QoS Policy
metadata:
  name: qos-natgw-example
spec:
  shared: true
  bindingType: NATGW
  bandwidthLimitRules:
    - name: net1-extip-ingress
      interface: net1
      rateMax: "5" # Mbps
      burstMax: "5" # Mbps
      priority: 2
      direction: ingress
      matchType: ip
      matchValue: src 172.18.11.22/32
    - name: net1-extip-egress
      interface: net1
      rateMax: "5" # Mbps
      burstMax: "5" # Mbps
      priority: 2
      direction: egress
      matchType: ip
      matchValue: dst 172.18.11.23/32
```

### VpcNatGateway

```
kind: VpcNatGateway
apiVersion: kubeovn.io/v1
metadata:
  name: gw1
spec:
  vpc: test-vpc-1
  subnet: net1
  lanIp: 10.0.1.254
  qosPolicy: qos-natgw-example
  selector:
    - "kubernetes.io/hostname: kube-ovn-worker"
    - "kubernetes.io/os: linux"
```

## 5.3.5 QoS NATGW

| label | qos | eip |
|-------|-----|-----|
|-------|-----|-----|

```
# kubectl get vpc-nat-gw -l ovn.kubernetes.io/qos=qos-natgw-example
NAME    VPC      SUBNET   LANIP
gw1    test-vpc-1  net1    10.0.1.254
```

## 5.3.6 qos

```
# kubectl get qos -A
NAME          SHARED   BINDINGTYPE
```

|                   |       |       |
|-------------------|-------|-------|
| qos-eip-example   | false | EIP   |
| qos-natgw-example | true  | NATGW |

### 5.3.7



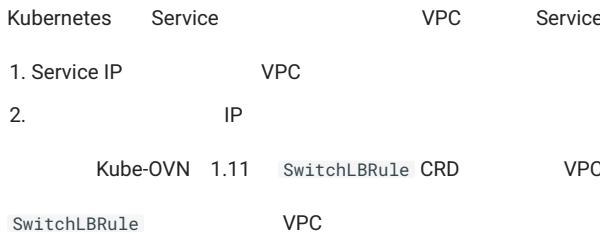
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### 5.3.8

## 5.4 VPC



### 5.4.1 Selector

```

  selector   label   pod
  SwitchLBRule
  
```

```

apiVersion: kubeovn.io/v1
kind: SwitchLBRule
metadata:
  name: cjh-slr-nginx
spec:
  vip: 1.1.1.1
  sessionAffinity: ClientIP
  namespace: default
  selector:
    - app:nginx
  ports:
    - name: dns
      port: 8888
      targetPort: 80
      protocol: TCP
  
```

- **selector**, **sessionAffinity**, **port**      Kubernetes Service
- **vip**      IP
- **namespace** **selector**      Pod

Kube-OVN    SwitchLBRule    Pod    Pod    VPC    L2 LB

### 5.4.2 Endpoints

```

  endpoints           selector           kubevirt   vm
  SwitchLBRule
  
```

```

apiVersion: kubeovn.io/v1
kind: SwitchLBRule
metadata:
  name: cjh-slr-nginx
spec:
  vip: 1.1.1.1
  sessionAffinity: ClientIP
  namespace: default
  endpoints:
    - 192.168.0.101
    - 192.168.0.102
    - 192.168.0.103
  ports:
    - name: dns
      port: 8888
      targetPort: 80
      protocol: TCP
  
```

- **sessionAffinity**, **port**      Kubernetes Service
- **vip**      IP
- **namespace** **selector**      Pod
- **endpoints**      IP

```
    selector  endpoints ,      selector
```

### 5.4.3

OVN IPv4

[Health Checks](<https://www.ovn.org/support/dist-docs/ovn-nb.5.html>)

```
ovn          SwitchLBRule      SwitchLBRule      VPC   subnet      vip           ip_port_mappings
load_balancer_health_check

•     vip       subnet         subnet           SwitchLBRule
•     Selector
```

```
root@server:~# kubectl get po -o wide -n vulpecula
NAME        READY   STATUS    RESTARTS   AGE     IP          NODE   NOMINATED NODE   READINESS GATES
nginx-78d9578975-f4qn4   1/1    Running   3        4d16h  10.16.0.4  worker <none>        <none>
nginx-78d9578975-t8tm5   1/1    Running   3        4d16h  10.16.0.6  worker <none>        <none>

#   slr
root@server:~# cat << END > slr.yaml
apiVersion: kubeovn.io/v1
kind: SwitchLBRule
metadata:
  name: nginx
  namespace: vulpecula
spec:
  vip: 1.1.1.1
  sessionAffinity: ClientIP
  namespace: default
  selector:
    - app:nginx
  ports:
    - name: dns
      port: 8888
      targetPort: 80
      protocol: TCP
END
root@server:~# kubectl apply -f slr.yaml
root@server:~# kubectl get slr
NAME      VIP      PORT(S)      SERVICE          AGE
vulpecula-nginx  1.1.1.1  8888/TCP  default/slr-vulpecula-nginx  3d21h
```

```
subnet      vip
```

```
#   vip
root@server:~# kubectl get vip
NAME      NS      V4IP      MAC      V6IP      PMAC      SUBNET      READY      TYPE
vulpecula-subnet  10.16.0.2  00:00:00:39:95:C1  <nil>      vulpecula-subnet  true
```

```
Load_Balancer_Health_Check  Service_Monitor
```

```
root@server:~# kubectl ko nbctl list Load_Balancer
_uuid      : 3ccb6d43-44aa-4028-962f-30d2dba9f0b8
external_ids  : {}
health_check  : [5bee3f12-6b54-411c-9cc8-c9def8f67356]
ip_port_mappings  : {"10.16.0.4":"nginx-78d9578975-f4qn4.default:10.16.0.2", "10.16.0.6":"nginx-78d9578975-t8tm5.default:10.16.0.2"}
name        : cluster-tcp-session-loadbalancer
options      : {affinity_timeout="10800"}
protocol    : tcp
selection_fields  : [ip_src]
vips        : {"1.1.1.1:8888":"10.16.0.4:80,10.16.0.6:80"}
```

```
root@server:~# kubectl ko nbctl list Load_Balancer_Health_Check
_uuid      : 5bee3f12-6b54-411c-9cc8-c9def8f67356
external_ids  : {switch_lb_subnet=vulpecula-subnet}
options      : {failure_count="3", interval="5", success_count="3", timeout="20"}
vip         : "1.1.1.1:8888"
```

```
root@server:~# kubectl ko sbctl list Service_Monitor
_uuid      : 1bddc541-cc49-44ea-9935-a4208f627a91
external_ids  : {}
ip          : "10.16.0.4"
logical_port  : nginx-78d9578975-f4qn4.default
options      : {failure_count="3", interval="5", success_count="3", timeout="20"}
port        : 80
protocol    : tcp
```

```

src_ip : "10.16.0.2"
src_mac : "c6:d4:b8:08:54:e7"
status : online

_uuid : 84dd24c5-e1b4-4e97-9daa-13687ed59785
external_ids : {}
ip : "10.16.0.6"
logical_port : nginx-78d9578975-t8tm5.default
options : {"failure_count="3", interval="5", success_count="3", timeout="20"}
port : 80
protocol : tcp
src_ip : "10.16.0.2"
src_mac : "c6:d4:b8:08:54:e7"
status : online

```

## vip

```

root@server:~# kubectl exec -it -n vulpecula nginx-78d9578975-t8tm5 -- curl 1.1.1.1:8888
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<p><em>Thank you for using nginx.</em></p>
</body>
</html>

```

## pod

```

kubectl delete po nginx-78d9578975-f4qn4
kubectl get po -o wide -n vulpecula
NAME           READY   STATUS    RESTARTS   AGE     IP          NODE   NOMINATED NODE   READINESS GATES
nginx-78d9578975-lxmvh   1/1    Running   0          31s    10.16.0.8   worker   <none>        <none>
nginx-78d9578975-t8tm5   1/1    Running   3          4d16h   10.16.0.6   worker   <none>        <none>

```

## Load\_Balancer\_Health\_Check Service\_Monitor

```

root@server:~# kubectl ko nbctl list Load_Balancer
_uuid : 3ccb6d43-44aa-4028-962f-30d2dba9f0b8
external_ids : {}
health_check : [5bee3f12-6b54-411c-9cc8-c9def8f67356]
ip_port_mappings : {"10.16.0.4":"nginx-78d9578975-f4qn4.default:10.16.0.2", "10.16.0.6":"nginx-78d9578975-t8tm5.default:10.16.0.2", "10.16.0.8":"nginx-78d9578975-lxmvh.default:10.16.0.2"}
name : cluster-tcp-session-loadbalancer
options : {"affinity_timeout="10800"}
protocol : tcp
selection_fields : [ip_src]
vips : {"1.1.1.1:8888"="10.16.0.6:80,10.16.0.8:80"}

root@server:~# kubectl ko nbctl list Load_Balancer_Health_Check
_uuid : 5bee3f12-6b54-411c-9cc8-c9def8f67356
external_ids : {switch_lb_subnet=vulpecula-subnet}
options : {"failure_count="3", interval="5", success_count="3", timeout="20"}
vip : "1.1.1.1:8888"

root@server:~# kubectl ko sbctl list Service_Monitor
_uuid : 84dd24c5-e1b4-4e97-9daa-13687ed59785
external_ids : {}
ip : "10.16.0.6"
logical_port : nginx-78d9578975-t8tm5.default
options : {"failure_count="3", interval="5", success_count="3", timeout="20"}
port : 80
protocol : tcp
src_ip : "10.16.0.2"
src_mac : "c6:d4:b8:08:54:e7"
status : online

_uuid : 5917b7b7-a999-49f2-a42d-da81f1eeb28f
external_ids : {}
ip : "10.16.0.8"
logical_port : nginx-78d9578975-lxmvh.default
options : {"failure_count="3", interval="5", success_count="3", timeout="20"}
port : 80
protocol : tcp
src_ip : "10.16.0.2"
src_mac : "c6:d4:b8:08:54:e7"
status : online

```

## SwitchLBRule Load\_Balancer\_Health\_Check Service\_Monitor vip

```

root@server:~# kubectl delete -f slr.yaml
switchlrule.kubeovn.io "vulpecula-nginx" deleted
root@server:~# kubectl get vip
No resources found

```

```
root@server:~# kubectl ko sbctl list Service_Monitor
root@server:~#
root@server:~# kubectl ko nbctl list Load_Balancer_Health_Check
root@server:~#
```

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5.4.4

---

## 5.5 VPC DNS



### 5.5.1 vpc-dns

```

apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRole
metadata:
  labels:
    kubernetes.io/bootstrapping: rbac-defaults
  name: system:vpc-dns
rules:
- apiGroups:
  - ""
  resources:
  - endpoints
  - services
  - pods
  - namespaces
  verbs:
  - list
  - watch
- apiGroups:
  - discovery.k8s.io
  resources:
  - endpointslices
  verbs:
  - list
  - watch
---
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
  annotations:
    rbac.authorization.kubernetes.io/autoupdate: "true"
  labels:
    kubernetes.io/bootstrapping: rbac-defaults
  name: vpc-dns
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: ClusterRole
  name: system:vpc-dns
subjects:
- kind: ServiceAccount
  name: vpc-dns
  namespace: kube-system
---
apiVersion: v1
kind: ServiceAccount
metadata:
  name: vpc-dns
  namespace: kube-system
---
apiVersion: v1
kind: ConfigMap
metadata:
  name: vpc-dns-corefile
  namespace: kube-system
data:
  Corefile: |
    .:53 {
      errors
      health {
        lameduck 5s
      }
      ready
      kubernetes cluster.local in-addr.arpa ip6.arpa {
        pods insecure
        fallthrough in-addr.arpa ip6.arpa
      }
      prometheus :9153
      forward . /etc/resolv.conf {
        prefer_udp
      }
    }
    cache 30

```

```

    loop
    reload
    loadbalance
}

```

nat-gw-pod

### 5.5.2

```

apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: ovn-nad
  namespace: default
spec:
  config: '{
    "cniVersion": "0.3.0",
    "type": "kube-ovn",
    "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
    "provider": "ovn-nad.default.ovn"
}'

```

### 5.5.3 vpc-dns Configmap

kube-system configmap vpc-dns vpc-dns

```

apiVersion: v1
kind: ConfigMap
metadata:
  name: vpc-dns-config
  namespace: kube-system
data:
  coredns-vip: 10.96.0.3
  enable-vpc-dns: "true"
  nad-name: ovn-nad
  nad-provider: ovn-nad.default.ovn

```

- enable-vpc-dns true
- coredns-image dns coredns
- coredns-vip coredns lb vip
- coredns-template coredns URL ovn coredns-template.yaml <https://raw.githubusercontent.com/kubeovn/kube-ovn/> /yamls/coredns-template.yaml
- nad-name network-attachment-definitions
- nad-provider provider
- k8s-service-host coredns k8s apiserver ip apiserver
- k8s-service-port coredns k8s apiserver port apiserver

### 5.5.4 vpc-dns

vpc-dns yaml

```

kind: VpcDns
apiVersion: kubeovn.io/v1
metadata:
  name: test-cjh1
spec:
  vpc: cjh-vpc-1
  subnet: cjh-subnet-1
  replicas: 2

```

- vpc dns vpc
- subnet dns
- replicas: vpc dns deployment replicas

```
# kubectl get vpc-dns
NAME      ACTIVE   VPC      SUBNET
test-cjh1  false    cjh-vpc-1  cjh-subnet-1
test-cjh2  true     cjh-vpc-1  cjh-subnet-2
```

```
ACTIVE : true      dns  false
          VPC      DNS
•  VPC      vpc-dns      VPC      subnet      vpc-dns      true      false
•  true   vpc-dns      false  vpc-dns
```

### 5.5.5

vpc-dns Pod      label app=vpc-dns      vpc-dns Pod

```
# kubectl -n kube-system get pods -l app=vpc-dns
NAME                  READY   STATUS    RESTARTS   AGE
vpc-dns-test-cjh1-7b878d96b4-g5979  1/1    Running   0          28s
vpc-dns-test-cjh1-7b878d96b4-ltmf9   1/1    Running   0          28s
```

slr

```
# kubectl -n kube-system get slr
NAME      VIP      PORT(S)      SERVICE      AGE
vpc-dns-test-cjh1  10.96.0.3  53/UDP, 53/TCP  kube-system/vpc-dns-test-cjh1  113s
```

VPC   Pod   dns :

```
nslookup kubernetes.default.svc.cluster.local 10.96.0.3
```

VPC   switch lb rule      VPC      Pod

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### 5.5.6

## 5.6 SecurityGroup

Kube-OVN      Pod

### ⚠ Warning

Kube-OVN    NetworkPolicy    Network Policy API    Subnet ACL    Security Group    OVN ACL    NetworkPolicy    NetworkPolicy API

### 5.6.1

```
apiVersion: kubeovn.io/v1
kind: SecurityGroup
metadata:
  name: sg-example
spec:
  allowSameGroupTraffic: true
  egressRules:
  - ipVersion: ipv4
    policy: allow
    priority: 1
    protocol: all
    remoteAddress: 10.16.0.13 # 10.16.0.0/16
    remoteType: address
  ingressRules:
  - ipVersion: ipv4
    policy: deny
    priority: 1
    protocol: icmp
    remoteAddress: 10.16.0.14
    remoteType: address
```

Kube-OVN

Pod      ovn.kubernetes.io/security\_groups annotation

ovn.kubernetes.io/security\_groups: sg-example

Port Security

### 5.6.2

|   |          |          |     |     |     |          |                   |
|---|----------|----------|-----|-----|-----|----------|-------------------|
| • | ACL      | OVN      | ACL | ACL |     |          |                   |
| • | priority | 1-200    | ACL | ACL | ACL | = 2300 - | ACL               |
| • |          | Kube-OVN | CNI | Pod | Pod | Pod      | ContainerCreating |

### 5.6.3

YAML    Pod    annotation

```
apiVersion: v1
kind: Pod
metadata:
  labels:
    app: static
  annotations:
    ovn.kubernetes.io/security_groups: 'sg-example'
  name: sg-test-pod
  namespace: default
spec:
  nodeName: kube-ovn-worker
  containers:
  - image: docker.io/library/nginx:alpine
    imagePullPolicy: IfNotPresent
    name: qatest
```

```
# kubectl get pod -o wide
NAME           READY   STATUS      RESTARTS   AGE     IP          NODE          NOMINATED NODE   READINESS GATES
sg-test-pod    0/1     ContainerCreating  0          5h32m  <none>     kube-ovn-worker  <none>        <none>
test-99fffff86-52h9r  1/1     Running     0          5h41m  10.16.0.14  kube-ovn-control-plane  <none>        <none>
test-99fffff86-qcgjw  1/1     Running     0          5h43m  10.16.0.13  kube-ovn-worker  <none>        <none>
```

### kubectl describe pod Pod

```
# kubectl describe pod sg-test-pod
Name:         sg-test-pod
Namespace:    default
Priority:    0
Node:        kube-ovn-worker/172.18.0.2
Start Time:  Tue, 28 Feb 2023 10:29:36 +0800
Labels:      app=static
Annotations: ovn.kubernetes.io/allocated: true
             ovn.kubernetes.io/cidr: 10.16.0.0/16
             ovn.kubernetes.io/gateway: 10.16.0.1
             ovn.kubernetes.io/ip_address: 10.16.0.15
             ovn.kubernetes.io/logical_router: ovn-cluster
             ovn.kubernetes.io/logical_switch: ovn-default
             ovn.kubernetes.io/mac_address: 00:00:00:FA:17:97
             ovn.kubernetes.io/pod_nic_type: veth-pair
             ovn.kubernetes.io/port_security: true
             ovn.kubernetes.io/routed: true
             ovn.kubernetes.io/security_groups: sg-allow-reject
Status:      Pending
IP:          <none>
IPs:         .
.
.
Events:
  Type  Reason          Age          From            Message
  ----  ----          ----          ----            -----
  Warning FailedCreatePodSandBox  5m3s (x70 over 4h59m)  kubelet  (combined from similar events): Failed to create pod sandbox: rpc error: code = Unknown desc = failed to setup network for sandbox "40636e0c7f1ade5500fa958486163d74f2e2300051a71522a9af7ba0538afb6": plugin type="kube-ovn" failed (add): RPC failed; request ip return 500 configure nic failed 10.16.0.15 network not ready after 200 ping 10.16.0.1
```

```
apiVersion: kubeovn.io/v1
kind: SecurityGroup
metadata:
  name: sg-gw-both
spec:
  allowSameGroupTraffic: true
  egressRules:
  - ipVersion: ipv4
    policy: allow
    priority: 2
    protocol: all
    remoteAddress: 10.16.0.13
    remoteType: address
  - ipVersion: ipv4
    policy: allow
    priority: 1
    protocol: all
    remoteAddress: 10.16.0.1
    remoteType: address
  ingressRules:
  - ipVersion: ipv4
    policy: deny
    priority: 2
    protocol: icmp
    remoteAddress: 10.16.0.14
    remoteType: address
  - ipVersion: ipv4
    policy: allow
    priority: 1
    protocol: icmp
    remoteAddress: 10.16.0.1
    remoteType: address
```

yaml      Pod      Pod

```
apiVersion: v1
kind: Pod
metadata:
  labels:
    app: static
  annotations:
    ovn.kubernetes.io/security_groups: 'sg-gw-both'
  name: sg-gw-both
  namespace: default
```

```
spec:
  nodeName: kube-ovn-worker
  containers:
  - image: docker.io/library/nginx:alpine
    imagePullPolicy: IfNotPresent
  name: qatest
```

**Pod**

```
# kubectl get pod -o wide
NAME          READY   STATUS      RESTARTS   AGE     IP           NODE      NOMINATED NODE   READINESS GATES
sg-test-pod   0/1     ContainerCreating   0          5h41m   <none>       kube-ovn-worker   <none>
sg-gw-both    1/1     Running     0          5h37m   10.16.0.19   kube-ovn-worker   <none>   <none>
```

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5.6.4

## 5.7 OVN EIP FIP SNAT DNAT

| <b>Note</b>    |                            |
|----------------|----------------------------|
| VPC            | VPC                        |
| VPC<br>Macvlan | VPC NAT<br>Pod<br>iptables |
| OVN            | OVN                        |
| Egress Gateway | VPC NAT                    |

VPC OVN NAT provider-network vlan (external) subnet VPC EIP/SNAT

### 5.7.1

- kube-ovn-controller kube-ovn-cni ovn-external-gw-config VPC spec enableExternal
- CRD provider-network vlan subnet VPC spec extraExternalSubnets ovn-eip ovn-dnat ovn-fip ovn-snats CRD

```
graph LR
pod-->subnet-->vpc-->lsp--bind-->gw-chassis-->snat-->lsp-->external-subnet
lsp--peer-->lsp
```

Pod SNAT Pod Fip

```
graph LR
pod-->subnet-->vpc-->lsp--bind-->local-chassis-->snat-->lsp-->external-subnet
lsp--peer-->lsp
```

Pod FIP (dnat\_and\_snat)

- CRD iptables nat gw
- ovn eip: ip underlay provider network vlan subnet
  - ovn fip dnat snat VPC ip vip
  - ovn snat VPC ip snat
  - ovn dnat router lb , ip + VPC endpoints

### 5.7.2 1.

OpenStack Neutron ovn provider network VPC EIP/SNAT

vlan vlan 0 vlan id

```
#
# 1. kube-ovn-controller
- --external-gateway-vlanid=204
- --external-gateway-switch=external204

# 2. kube-ovn-cni :
- --external-gateway-switch=external204
```

```
###          vlan id          underlay
.
.
.
provider network vlan subnet
VPC enable_eip_snat      vlan subnet      ip ipam
VPC enable_eip_snat ,    pod annotation  fip snat
VPC enable_eip_snat      vlan subnet      VPC eip snat
```

## 1.1 underlay

```
# provider-network vlan subnet
# cat 01-provider-network.yaml

apiVersion: kubeovn.io/v1
kind: ProviderNetwork
metadata:
  name: external204
spec:
  defaultInterface: vlan

# cat 02-vlan.yaml

apiVersion: kubeovn.io/v1
kind: Vlan
metadata:
  name: vlan204
spec:
  id: 204
  provider: external204

# cat 03-vlan-subnet.yaml

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: external204
spec:
  protocol: IPv4
  cidrBlock: 10.5.204.0/24
  gateway: 10.5.204.254
  vlan: vlan204
  excludeIps:
  - 10.5.204.1..10.5.204.100
```

## 1.2 VPC eip\_snat

```
# VPC underlay provider subnet
# cat 00-centralized-external-gw-no-ip.yaml

apiVersion: v1
kind: ConfigMap
metadata:
  name: ovn-external-gw-config
  namespace: kube-system
data:
  enable-external-gw: "true"
  external-gw-nodes: "pc-node-1,pc-node-2,pc-node-3"
  type: "centralized"
  external-gw-nic: "vlan" # ovs
  external-gw-addr: "10.5.204.254/24" # underlay ip
```

| logical router port (lrp) | ip  | mac     | underlay | lrp | ovn | eip |
|---------------------------|-----|---------|----------|-----|-----|-----|
| ip                        | lrp | ovn-eip |          | lrp | ovn | eip |

## 1.3 VPC eip snat fip

node

```
# external-gw-nodes
kubectl label nodes pc-node-1 pc-node-2 pc-node-3 ovn.kubernetes.io/external-gw=true

# cat 00-ns.yaml

apiVersion: v1
```

```

kind: Namespace
metadata:
  name: vpc1

# cat 01-vpc-ecmp-enable-external-bfd.yml

kind: Vpc
apiVersion: kubeovn.io/v1
metadata:
  name: vpc1
spec:
  namespaces:
    - vpc1
  enableExternal: true
  staticRoutes:
    - cidr: 0.0.0.0/0
      nextHopIP: 10.5.204.254
      policy: policyDst

# VPC      enableExternal      lrp

# cat 02-subnet.yml

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: vpc1-subnet1
spec:
  cidrBlock: 192.168.0.0/24
  default: false
  disableGatewayCheck: false
  disableInterConnection: true
  enableEcmp: true
  gatewayNode: ""
  gatewayType: distributed
  #gatewayType: centralized
  natOutgoing: false
  private: false
  protocol: IPv4
  provider: ovn
  vpc: vpc1
  namespaces:
    - vpc1

#
#          subnet

```

```

# kubectl ko nbctl show vpc1

router 87ad06fd-71d5-4ff8-a1f0-54fa3bba1a7f (vpc1)
  port vpc1-vpc1-subnet1
    mac: "00:00:00:ED:8E:C7"
    networks: ["192.168.0.1/24"]
  port vpc1-external204
    mac: "00:00:00:EF:05:C7"
    networks: ["10.5.204.105/24"]
    gateway chassis: [7cedd14f-265b-42e5-ac17-e03e7a1f2342 276bacb-f9c-4476-b41d-05872a94976d fd9f140c-c45d-43db-a6c0-0d4f8ea298dd]
  nat 21d853b0-f7b4-40bd-9a53-31d2e2745739
    external ip: "10.5.204.115"
    logical ip: "192.168.0.0/24"
    type: "snat"

```

```

# kubectl ko nbctl lr-route-list vpc1

IPv4 Routes
Route Table <main>:
  0.0.0.0/0           10.5.204.254 dst-ip
#   VPC CRD

```

enableExternal

VPC CRD

## 1.4

### 1.4.1 UNDERLAY

eip snat fip 1 eip snat fip

```

#   provider-network  vlan  subnet
# cat 01-extra-provider-network.yaml
apiVersion: kubeovn.io/v1
kind: ProviderNetwork
metadata:
  name: extra
spec:
  defaultInterface: vlan
# cat 02-extra-vlan.yaml

```

```

apiVersion: kubeovn.io/v1
kind: Vlan
metadata:
  name: wlan0
spec:
  id: 0
  provider: extra
# cat 03-extra-vlan-subnet.yaml
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: extra
spec:
  protocol: IPv4
  cidrBlock: 10.10.204.0/24
  gateway: 10.10.204.254
  vlan: wlan0
  excludeIps:
    - 10.10.204.1..10.10.204.100

```

#### 1.4.2 VPC

```

apiVersion: kubeovn.io/v1
kind: Vpc
metadata:
  name: vpc1
spec:
  namespaces:
    - vpc1
  enableExternal: true #   enableExternal   VPC           external   ls
  extraExternalSubnets: #   extraExternalSubnets
    - extra

```

```

# kubectl get nbctl show vpc1
router 87ad06fd-71d5-4ff8-a1f0-54fa3bba1a7f (vpc1)
  port vpc1-vpc1-subnet1
    mac: "00:00:00:ED:8E:C7"
    networks: ["192.168.0.1/24"]
  port vpc1-external1204
    mac: "00:00:00:EF:05:C7"
    networks: ["10.5.204.105/24"]
    gateway chassis: [7cedd14f-265b-42e5-ac17-e03e7a1f2342 276baccc-f9c-4476-b41d-05872a94976d fd9f140c-c45d-43db-a6c0-0d4f8ea298dd]
  port vpc1-extra
    mac: "00:00:00:EF:6A:C7"
    networks: ["10.10.204.105/24"]
    gateway chassis: [7cedd14f-265b-42e5-ac17-e03e7a1f2342 276baccc-f9c-4476-b41d-05872a94976d fd9f140c-c45d-43db-a6c0-0d4f8ea298dd]

```

### 5.7.3 2. ovn-eip

| iptables-eip | ovn-eip            | type                   |
|--------------|--------------------|------------------------|
| • nat:       | ovn dnat fip, snat | nat                    |
| • lrp:       | underlay           | lrp ip dnat snat       |
| • lsp:       | ovn bfd ecmp       | ovs internal port ecmp |

```

---
kind: OvnEip
apiVersion: kubeovn.io/v1
metadata:
  name: eip-static
spec:
  externalSubnet: external1204
  type: nat
#       eip          fip

```

|                |             |
|----------------|-------------|
| externalSubnet | external204 |
| externalSubnet | extra       |

#### 2.1 ovn-fip pod fip

```

# kubectl get po -o wide -n vpc1 vpc-1-busybox01
NAME        READY   STATUS    RESTARTS   AGE      IP          NODE
vpc-1-busybox01  1/1     Running   0          3d15h   192.168.0.2   pc-node-2

# kubectl get ip vpc-1-busybox01.vpc1

```

```

NAME      V4IP      V6IP      MAC      NODE      SUBNET
vpc-1-busybox01.vpc1  192.168.0.2          00:00:00:0A:DD:27  pc-node-2  vpc1-subnet1

---
kind: OvnEip
apiVersion: kubeovn.io/v1
metadata:
  name: eip-static
spec:
  externalSubnet: external204
  type: nat

---
kind: OvnFip
apiVersion: kubeovn.io/v1
metadata:
  name: eip-static
spec:
  ovnEip: eip-static
  ipName: vpc-1-busybox01.vpc1 #      ip crd
  type: "centralized"           # centralized     distributed

--#
#      VPC      ip

kind: OvnFip
apiVersion: kubeovn.io/v1
metadata:
  name: eip-static
spec:
  ovnEip: eip-static
  vpc: vpc1
  v4Ip: 192.168.0.2
  type: "centralized"           # centralized     distributed

```

```

# kubectl get ofip
NAME      VPC      V4EIP      V4IP      READY    IPTYPE    IPNAME
eip-for-vip  vpc1  10.5.204.106  192.168.0.3  true    vip      test-fip-vip
eip-static   vpc1  10.5.204.101  192.168.0.2  true    vpc1-busybox01.vpc1
# kubectl get ofip eip-static
NAME      VPC      V4EIP      V4IP      READY    IPTYPE    IPNAME
eip-static   vpc1  10.5.204.101  192.168.0.2  true    vpc1-busybox01.vpc1

[root@pc-node-1 03-cust-vpc]# ping 10.5.204.101
PING 10.5.204.101 (10.5.204.101) 56(84) bytes of data.
64 bytes from 10.5.204.101: icmp_seq=2 ttl=62 time=1.21 ms
64 bytes from 10.5.204.101: icmp_seq=3 ttl=62 time=0.624 ms
64 bytes from 10.5.204.101: icmp_seq=4 ttl=62 time=0.368 ms
^C
--- 10.5.204.101 ping statistics ---
4 packets transmitted, 3 received, 25% packet loss, time 3049ms
rtt min/avg/max/mdev = 0.368/0.734/1.210/0.352 ms
[root@pc-node-1 03-cust-vpc]#

```

```

#      node ping      VPC      pod      ip

#      ip
# kubectl ko nbctl show vpc1
router 87ad6fd-71d5-4ff8-a1f0-54fa3bba1a7f (vpc1)
  port vpc1-vpc1-subnet1
    mac: "00:00:00:ED:8E:C7"
    networks: ["192.168.0.1/24"]
  port vpc1-external204
    mac: "00:00:00:EF:05:C7"
    networks: ["10.5.204.105/24"]
  gateway chassis: [7cedd14f-265b-42e5-ac17-e03e7a1f2342 276baccb-fe9c-4476-b41d-05872a94976d fd9f140c-c45d-43db-a6c0-0d4f8ea298dd]
  nat 813523e7-c68c-408f-bd8c-cba30cb2e4f4
    external ip: "10.5.204.101"
    logical ip: "192.168.0.2"
    type: "dnat_and_snat"

```

## 2.2 ovn-fip vip fip

```

vip      kubevirt      vip      keepalived kube-vip

fip      VPC      vip      vip

```

```

#      vip      eip      eip      vip
# cat vip.yaml

apiVersion: kubeovn.io/v1
kind: Vip
metadata:
  name: test-fip-vip
spec:
  subnet: vpc1-subnet1

```

```

# cat 04-fip.yaml

---
kind: OvnEip
apiVersion: kubeovn.io/v1
metadata:
  name: eip-for-vip
spec:
  externalSubnet: external204
  type: nat

---
kind: OvnFip
apiVersion: kubeovn.io/v1
metadata:
  name: eip-for-vip
spec:
  ovnEip: eip-for-vip
  ipType: vip      #     fip      pod ip          vip
  ipName: test-fip-vip

---
#       VPC      ip

kind: OvnFip
apiVersion: kubeovn.io/v1
metadata:
  name: eip-for-vip
spec:
  ovnEip: eip-for-vip
  ipType: vip      #     fip      pod ip          vip
  vpc: vpc1
  v4Ip: 192.168.0.3

# kubectl get ofip
NAME      VPC      V4EIP      V4IP      READY    IPTYPE    IPNAME
eip-for-vip  vpc1  10.5.204.106  192.168.0.3  true    vip      test-fip-vip

[root@pc-node-1 fip-vip]# ping 10.5.204.106
PING 10.5.204.106 (10.5.204.106) 56(84) bytes of data.
64 bytes from 10.5.204.106: icmp_seq=1 ttl=62 time=0.694 ms
64 bytes from 10.5.204.106: icmp_seq=2 ttl=62 time=0.436 ms

#   node   ping

# pod   ip

[root@pc-node-1 fip-vip]# kubectl -n vpc1 exec -it vpc-1-busybox03 -- bash
[root@vpc-1-busybox03 /]#
[root@vpc-1-busybox03 /]# ip a
[root@vpc-1-busybox03 /]# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
  link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
  inet 127.0.0.1/8 scope host lo
    valid_lft forever preferred_lft forever
  inet6 ::1/128 scope host
    valid_lft forever preferred_lft forever
1568: eth0@if1569: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default
  link/ether 00:00:00:56:40:e5 brd ff:ff:ff:ff:ff:ff link-netnsid 0
  inet 192.168.0.5/24 brd 192.168.0.255 scope global eth0
    valid_lft forever preferred_lft forever
  inet 192.168.0.3/24 scope global secondary eth0 #      vip
    valid_lft forever preferred_lft forever
  inet6 fe80::200:ff:fe5:64 scope link
    valid_lft forever preferred_lft forever

[root@vpc-1-busybox03 /]# tcpdump -i eth0 host 192.168.0.3 -netvv
tcpdump: listening on eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
00:00:00:ed:8e:c7 > 00:00:00:56:40:e5, ethertype IPv4 (0x0800), length 98: (tos 0x0, ttl 62, id 44830, offset 0, flags [DF], proto ICMP (1), length 84)
  10.5.32.51 > 192.168.0.3: ICMP echo request, id 177, seq 1, length 64
00:00:00:56:40:e5 > 00:00:00:ed:8e:c7, ethertype IPv4 (0x0800), length 98: (tos 0x0, ttl 64, id 43962, offset 0, flags [none], proto ICMP (1), length 84)
  192.168.0.3 > 10.5.32.51: ICMP echo reply, id 177, seq 1, length 64

# pod      fip      icmp

```

## 5.7.4 3. ovn-snat

### 3.1 ovn-snat subnet cidr

## iptables-snat

```
# cat 03-subnet-snat.yaml

---
kind: OvnEp
apiVersion: kubeovn.io/v1
metadata:
```

```
        name: snat-for-subnet-in-vpc
spec:
  externalSubnet: external1204
  type: nat

---
kind: OvnSnatRule
apiVersion: kubeovn.io/v1
metadata:
  name: snat-for-subnet-in-vpc
spec:
  ovnEip: snat-for-subnet-in-vpc
  vpcSubnet: vpc1-subnet1 # eip

---
#          VPC      subnet    cidr
kind: OvnSnatRule
apiVersion: kubeovn.io/v1
metadata:
  name: snat-for-subnet-in-vpc
spec:
  ovnEip: snat-for-subnet-in-vpc
  vpc: vpc1
  v4IpCidr: 192.168.0.0/24 #           cidr
  ip
```

externalSubnet extra

### 3.2 ovn-snat      pod ip

## iptables-snat

```
# cat 03-pod-snat.yaml

---
kind: OvnEip
apiVersion: kubeovn.io/v1
metadata:
  name: snat-for-pod-vpc-ip
spec:
  externalSubnet: external204
  type: nat

---
kind: OvnSnatRule
apiVersion: kubeovn.io/v1
metadata:
  name: snat01
spec:
  ovnEip: snat-for-pod-vpc-ip
  ipName: vpc-1-busybox02.vpc1 # eip
  pod ip

---
#          VPC      ip

kind: OvnSnatRule
apiVersion: kubeovn.io/v1
metadata:
  name: snat-for-subnet-in-vpc
spec:
  ovnEip: snat-for-subnet-in-vpc
  vpc: vpc1
  v4Ipcidr: 192.168.0.4
```

`externalSubnet` `extra`

snat

```
# kubectl get vpc1
router 87ad06fd-71d5-4ff8-a1f0-54fa3bba1a7f (vpc1)
  port vpc1-subnet1
    mac: "00:00:00:ED:8E:C7"
    networks: ["192.168.0.1/24"]
  port vpc1-external204
    mac: "00:00:00:EF:05:C7"
    networks: ["10.5.204.105/24"]
    gateway chassis: [7cedd14f-265b-42e5-ac17-e03e7a1f2342 276baccb-fe9c-4476-b41d-05872a94976d fd9f140c-c45d-43db-a6c0-0d4f8ea298dd]
nat 21d853b0-f7b4-40bd-9a53-31d2e2745739
  external ip: "10.5.204.115"
  logical ip: "192.168.0.0/24"
  type: "snat"
nat da77a11f-c523-439c-b1d1-72c664196a0f
  external ip: "10.5.204.116"
  logical ip: "192.168.0.4"
  type: "snat"
```

```
[root@pc-node-1 03-cust-vpc]# kubectl get po -A -o wide | grep busy
vpc1           vpc-1-busybox01          1/1   Running   0      3d15h  192.168.0.2  pc-node-2  <none>    <none>
vpc1           vpc-1-busybox02          1/1   Running   0      17h   192.168.0.4  pc-node-1  <none>    <none>
vpc1           vpc-1-busybox03          1/1   Running   0      17h   192.168.0.5  pc-node-1  <none>    <none>
vpc1           vpc-1-busybox04          1/1   Running   0      17h   192.168.0.6  pc-node-3  <none>    <none>
vpc1           vpc-1-busybox05          1/1   Running   0      17h   192.168.0.7  pc-node-1  <none>    <none>

# kubectl exec -it -n vpc1           vpc-1-busybox04 bash
kubectl exec [POD] [COMMAND] is DEPRECATED and will be removed in a future version. Use kubectl exec [POD] -- [COMMAND] instead.
[root@vpc-1-busybox04 /]#
[root@vpc-1-busybox04 /]#
[root@vpc-1-busybox04 /]# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
  link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
      valid_lft forever preferred_lft forever
  inet6 ::1/128 scope host
    valid_lft forever preferred_lft forever
17095: eth0@if17096: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default
  link/ether 00:00:00:76:94:55 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 192.168.0.6/24 brd 192.168.0.255 scope global eth0
      valid_lft forever preferred_lft forever
    inet6 fe80::200:ff:fe76:9455/64 scope link
      valid_lft forever preferred_lft forever
[root@vpc-1-busybox04 /]# ping 223.5.5.5
PING 223.5.5.5 (223.5.5.5) 56(84) bytes of data.
64 bytes from 223.5.5.5: icmp_seq=1 ttl=114 time=22.2 ms
64 bytes from 223.5.5.5: icmp_seq=2 ttl=114 time=21.8 ms

[root@pc-node-1 03-cust-vpc]# kubectl exec -it -n vpc1           vpc-1-busybox02 bash
kubectl exec [POD] [COMMAND] is DEPRECATED and will be removed in a future version. Use kubectl exec [POD] -- [COMMAND] instead.
[root@vpc-1-busybox02 /]#
[root@vpc-1-busybox02 /]#
[root@vpc-1-busybox02 /]#
[root@vpc-1-busybox02 /]# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
  link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
      valid_lft forever preferred_lft forever
  inet6 ::1/128 scope host
    valid_lft forever preferred_lft forever
1566: eth0@if1567: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default
  link/ether 00:00:00:0b:e9:d0 brd ff:ff:ff:ff:ff:ff link-netnsid 0
    inet 192.168.0.4/24 brd 192.168.0.255 scope global eth0
      valid_lft forever preferred_lft forever
    inet6 fe80::200:ff:fe0b:e9d0/64 scope link
      valid_lft forever preferred_lft forever
[root@vpc-1-busybox02 /]# ping 223.5.5.5
PING 223.5.5.5 (223.5.5.5) 56(84) bytes of data.
64 bytes from 223.5.5.5: icmp_seq=2 ttl=114 time=22.7 ms
64 bytes from 223.5.5.5: icmp_seq=3 ttl=114 time=22.6 ms
64 bytes from 223.5.5.5: icmp_seq=4 ttl=114 time=22.1 ms
^C
--- 223.5.5 ping statistics ---
4 packets transmitted, 3 received, 25% packet loss, time 3064ms
rtt min/avg/max/mdev = 22.126/22.518/22.741/0.278 ms

#       pod      snat

#
```

## 5.7.5 4. ovn-dnat

### 4.1 ovn-dnat pod dnat

```
kind: OvnEip
apiVersion: kubeovn.io/v1
metadata:
  name: eip-dnat
spec:
  externalSubnet: underlay

---
kind: OvnDnatRule
apiVersion: kubeovn.io/v1
metadata:
  name: eip-dnat
spec:
  ovnEip: eip-dnat
  ipName: vpc-1-busybox01.vpc1 #      pod ip crd
  protocol: tcp
  internalPort: "22"
  externalPort: "22"

#
#       VPC      ip

kind: OvnDnatRule
apiVersion: kubeovn.io/v1
metadata:
  name: eip-dnat
```

```
spec:  
  ovnEip: eip-dnat  
  protocol: tcp  
  internalPort: "22  
  externalPort: "22  
  vpc: vpc1  
  v4Ip: 192.168.0.3
```

externalSubnet extra

## OvnDnatRule      IptablesDnatRule

```
# kubectl get oeip eip-dnat
NAME      V4IP          V6IP      MAC                TYPE    READY
eip-dnat  10.5.49.4    00:00:00:4D:CE:49  dnat    true

# kubectl get odnat
NAME      EIP          PROTOCOL  V4EIP        V4IP        INTERNALPORT  EXTERNALPORT  IPNAME
eip-dnat eip-dnat     tcp       10.5.49.4  192.168.0.3  22           22           vpc-1-busybox01.vpc1
                                                 READY
                                                 true
```

## 4.2 ovn-dnat    vip        dnat

```
kind: OvnDnatRule
apiVersion: kubeovn.io/v1
metadata:
  name: eip-dnat
spec:
  ipType: vip #      dnat      pod ip
  ovnIp: eip-dnat
  ipName: test-dnat-vip
  protocol: tcp
  internalPort: "22"
  externalPort: "22"

---
#          VPC      ip

kind: OvnDnatRule
apiVersion: kubeovn.io/v1
metadata:
  name: eip-dnat
spec:
  ipType: vip #      dnat      pod ip
  ovnIp: eip-dnat
  ipName: test-dnat-vip
  protocol: tcp
  internalPort: "22"
  externalPort: "22"
  vpc: vpc1
  v4Ip: 192.168.0.4
```

## OvnDnatRule      IptablesDnatRule

```
# kubectl get vip test-dnat-vip
NAME          V4IP           PV4IP   MAC                   PMAC    V6IP   PV6IP   SUBNET      READY
test-dnat-vip 192.168.0.4     00:00:00:D0:C0:B5   vpc1-subnet1  true

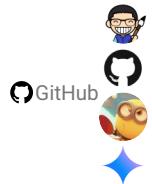
# kubectl get oeip eip-dnat
NAME          V4IP       V6IP   MAC                   TYPE    READY
eip-dnat     10.5.49.4  00:00:00:4D:CE:49  dnat    true

# kubectl get ednat eip-dnat
NAME          EIP        PROTOCOL  V4EIP      V4IP           INTERNALPORT  EXTERNALPORT  IPNAME      READY
eip-dnat     eip-dnat   tcp       10.5.49.4  192.168.0.4  22            22           test-dnat-vip  true
```



⌚2025 9 30

⌚2023 3 3



5.7.6

---

## 5.8 OVN SNAT ECMP BFD L3 HA

---

VPC OVN SNAT ECMP Gateway Node ovnnext0

- bfd
- hash

```
graph LR
pod --> vpc-subnet --> vpc --> snat --> ecmp --> external-subnet --> gw-node1-ovnnext0 --> node1-external-switch
external-subnet --> gw-node2-ovnnext0 --> node2-external-switch
external-subnet --> gw-node3-ovnnext0 --> node3-external-switch
```

ovn-eip-fip-snat.md install.sh provider-network vlan subnet

lsp ovn-eip vpc enable\_bfd bfd ecmp

### 5.8.1 1.

#### 1.1 underlay

#### 1.2 vpc eip\_snat

#### 1.3 VPC eip snat fip

ovn-eip-fip-snat.md VPC ecmp bfd

VPC 2 ovn-eip

```
# cat gw-node-eip.yaml
---
kind: OvnEip
apiVersion: kubeovn.io/v1
metadata:
  name: pc-node-1
spec:
  externalSubnet: external204
  type: lsp

---
kind: OvnEip
apiVersion: kubeovn.io/v1
metadata:
  name: pc-node-2
spec:
  externalSubnet: external204
  type: lsp

---
kind: OvnEip
apiVersion: kubeovn.io/v1
metadata:
  name: pc-node-3
spec:
  externalSubnet: external204
  type: lsp
```

vpc ecmp vpc bfd enable bfd lrp ovn eip bfd

### 5.8.2 2. vpc ecmp bfd L3 HA

```
# cat 01-vpc-ecmp-enable-external-bfd.yml
kind: Vpc
apiVersion: kubeovn.io/v1
metadata:
  name: vpc1
spec:
  namespaces:
  - vpc1
  enableExternal: true
  enableBfd: true # bfd
  #enableBfd: false
```

```
# cat 02-subnet.yml
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: vpc1-subnet1
spec:
  cidrBlock: 192.168.0.0/24
  default: false
  disableGatewayCheck: false
  disableInterConnection: true
  enableEcmp: true # ecmp
  gatewayNode: ""
  gatewayType: distributed
  #gatewayType: centralized
  natOutgoing: false
  private: false
  protocol: IPv4
  provider: ovn
  vpc: vpc1
  namespaces:
    - vpc1
```

:

1. vpc ecmp ecmp bfd vpc enableBfd subnet enableEcmp ecmp bfd
- 2.
3. VPC VPC VPC snat
4. vpc subnet enableEcmp gatewayType
5. EnableExternal vpc
6. EnableExternal EnableBfd

```
#       ovn
#   vpc
# k get vpc
NAME      ENABLEEXTERNAL  ENABLEBFD  STANDBY  SUBNETS          NAMESPACES
ovn-cluster  true        true      true     ["external204","join","ovn-default"]
vpc1       true        true      true     ["vpc1-subnet1"]      ["vpc1"]

#   vpc  ENABLEBFD
#   vpc

# 1.   bfd
# k ko nbctl list bfd
_uuid           : be7df545-2c4c-4751-878f-b3507987f050
detect_mult    : 3
dst_ip         : "10.5.204.121"
external_ids   : {}
logical_port   : vpc1-external204
min_rx         : 100
min_tx         : 100
options         : {}
status          : up

_uuid           : 684c4489-5b59-4693-8d8c-3beab93f8093
detect_mult    : 3
dst_ip         : "10.5.204.109"
external_ids   : {}
logical_port   : vpc1-external204
min_rx         : 100
min_tx         : 100
options         : {}
status          : up

_uuid           : f0f62077-2ae9-4e79-b4f8-a446ec6e784c
detect_mult    : 3
dst_ip         : "10.5.204.108"
external_ids   : {}
logical_port   : vpc1-external204
min_rx         : 100
min_tx         : 100
options         : {}
status          : up

###   status      up

# 2.   bfd
# k ko nbctl lr-route-list vpc1
IPv4 Routes
Route Table <main>:
  192.168.0.0/24      10.5.204.108 src-ip ecmp ecmp-symmetric-reply bfd
  192.168.0.0/24      10.5.204.109 src-ip ecmp ecmp-symmetric-reply bfd
  192.168.0.0/24      10.5.204.121 src-ip ecmp ecmp-symmetric-reply bfd
```

```

# 3.

# kubectl get Logical_Router_Static_Route -o yaml
apiVersion: ovn.k8s.ovn.org/v1
kind: Logical_Router_Static_Route
metadata:
  name: static-route-1
spec:
  policy: src-ip
  options:
    ecmp_symmetric_reply: true
  route_table: ""

  _uid: 3aacb384-d5ee-4b14-aebf-59e8c11717ba
  bdf: 684c4489-5b59-4693-8d8c-3beab93f8093
  external_ids: {}
  ip_prefix: "192.168.0.0/24"
  nexthop: "10.5.204.109"
  output_port: []
  route_table: ""

  _uid: 18bcc585-bc05-430b-925b-ef673c8e1aef
  bdf: f0f62077-2ae9-4e79-b4f8-a446ec6e784c
  external_ids: {}
  ip_prefix: "192.168.0.0/24"
  nexthop: "10.5.204.108"
  options:
    ecmp_symmetric_reply: true
  output_port: []
  policy: src-ip
  route_table: ""

  _uid: 7d0a4e6b-cde0-4110-8176-fbaf19738498
  bdf: be7df545-2c4c-4751-878f-b3507987f050
  external_ids: {}
  ip_prefix: "192.168.0.0/24"
  nexthop: "10.5.204.121"
  options:
    ecmp_symmetric_reply: true
  output_port: []
  policy: src-ip
  route_table: ""

# [root@pc-node-1 ~]# ip netns exec ovnnext bash ip a
[root@pc-node-1 ~]# ip netns exec ovnnext ip a
[1: lo <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
 link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
 inet 127.0.0.1/8 scope host lo
   valid_lft forever preferred_lft forever
  inet6 ::1/128 scope host
    valid_lft forever preferred_lft forever
1541: ovnnext0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1400 qdisc noqueue state UNKNOWN group default qlen 1000
  link/ether 00:00:00:ab:bd:87 brd ff:ff:ff:ff:ff:ff
  inet 10.5.204.108/24 brd 10.5.204.255 scope global ovnnext0
    valid_lft forever preferred_lft forever
  inet6 fe80::200:ff:feab:bd87/64 scope link
    valid_lft forever preferred_lft forever
[root@pc-node-1 ~]#
[root@pc-node-1 ~]# ip netns exec ovnnext route -n
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref  Use Iface
0.0.0.0          10.5.204.254  0.0.0.0        UG    0      0      0 ovnnext0
10.5.204.0       0.0.0.0        255.255.255.0  U      0      0      0 ovnnext0
##           internal port unerlay    pod      ns
[1: lo <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
 link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
 inet 127.0.0.1/8 scope host lo
   valid_lft forever preferred_lft forever
  inet6 ::1/128 scope host
    valid_lft forever preferred_lft forever
1541: ovnnext0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1400 qdisc noqueue state UNKNOWN group default qlen 1000
  link/ether 00:00:00:ab:bd:87 brd ff:ff:ff:ff:ff:ff
  inet 10.5.204.108/24 brd 10.5.204.255 scope global ovnnext0
    valid_lft forever preferred_lft forever
  inet6 fe80::200:ff:feab:bd87/64 scope link
    valid_lft forever preferred_lft forever
[root@pc-node-1 ~]#
[root@pc-node-1 ~]# ip netns exec ovnnext ping -c1 223.5.5.5
PING 223.5.5.5 (223.5.5.5) 56(84) bytes of data.
64 bytes from 223.5.5.5: icmp_seq=1 ttl=115 time=21.6 ms
#
```

### ovnnext ns

```

# tcpdump -i ovnnext0 host 223.5.5.5 -netvv
dropped privs to tcpdump
tcpdump: listening on ovnnext0, link-type EN10MB (Ethernet), capture size 262144 bytes
^C
0 packets captured
0 packets received by filter
0 packets dropped by kernel
[root@pc-node-1 ~]# exit
[root@pc-node-1 ~]# ssh pc-node-2
Last login: Thu Feb 23 09:21:08 2023 from 10.5.32.51
[root@pc-node-2 ~]# ip netns exec ovnnext bash
[root@pc-node-2 ~]# tcpdump -i ovnnext0 host 223.5.5.5 -netvv
dropped privs to tcpdump
tcpdump: listening on ovnnext0, link-type EN10MB (Ethernet), capture size 262144 bytes
^C
0 packets captured
0 packets received by filter

```

```

0 packets dropped by kernel
[root@pc-node-2 ~]# exit
[root@pc-node-2 ~]# logout
Connection to pc-node-2 closed.
[root@pc-node-1 ~]# ssh pc-node-3
Last login: Thu Feb 23 08:32:41 2023 from 10.5.32.51
[root@pc-node-3 ~]# ip netns exec ovnnext bash
[root@pc-node-3 ~]# tcpdump -i ovnnext0 host 223.5.5.5 -netvv
dropped privs to tcpdump
tcpdump: listening on ovnnext0, link-type EN10MB (Ethernet), capture size 262144 bytes
00:00:00:2d:f8:ce > 00:00:00:fd:b2:a4, ethertype IPv4 (0x0800), length 98: (tos 0x0, ttl 63, id 57978, offset 0, flags [DF], proto ICMP (1), length 84)
    10.5.204.102 > 223.5.5.5: ICMP echo request, id 22, seq 71, length 64
00:00:00:fd:b2:a4 > dc:ef:80:5a:44:1a, ethertype IPv4 (0x0800), length 98: (tos 0x0, ttl 62, id 57978, offset 0, flags [DF], proto ICMP (1), length 84)
    10.5.204.102 > 223.5.5.5: ICMP echo request, id 22, seq 71, length 64
^C
2 packets captured
2 packets received by filter
0 packets dropped by kernel
[root@pc-node-3 ~]#
#       down          pod
#       3

```

### 5.8.3 3. bfd

#### vpc enable\_eip\_snat

```

# cat 01-vpc-ecmp-enable-external-bfd.yml
kind: Vpc
apiVersion: kubeovn.io/v1
metadata:
  name: vpc2
spec:
  namespaces:
  - vpc2
  enableExternal: true
  #enableBfd: true
  enableBfd: false

##   bfd

# k ko nbctl lr-route-list vpc2
IPv4 Routes
Route Table <main>:
      0.0.0.0/0           10.5.204.254 dst-ip

#
#   nbctl list bfd      lrp      bfd
#   ovnnext ns      bfd
#       vpc subnet     ping      ( )
#       ( )

```



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### 5.8.4

## 5.9 VPC

---

|     |     |     |     |
|-----|-----|-----|-----|
| VPC | VPC | VPC | NAT |
|-----|-----|-----|-----|

### 5.9.1

1. VPC
2. VPC CIDR
3. VPC VPC

### 5.9.2

|     |     |        |      |
|-----|-----|--------|------|
| VPC | VPC | Subnet | CIDR |
|-----|-----|--------|------|

```
kind: Vpc
apiVersion: kubeovn.io/v1
metadata:
  name: vpc-1
spec: {}
---
kind: Subnet
apiVersion: kubeovn.io/v1
metadata:
  name: net1
spec:
  vpc: vpc-1
  cidrBlock: 10.0.0.0/16
---
kind: Vpc
apiVersion: kubeovn.io/v1
metadata:
  name: vpc-2
spec: {}
---
kind: Subnet
apiVersion: kubeovn.io/v1
metadata:
  name: net2
spec:
  vpc: vpc-2
  cidrBlock: 172.31.0.0/16
```

|     |             |  |  |
|-----|-------------|--|--|
| VPC | vpcPeerings |  |  |
|-----|-------------|--|--|

```
kind: Vpc
apiVersion: kubeovn.io/v1
metadata:
  name: vpc-1
spec:
  vpcPeerings:
    - remoteVpc: vpc-2
      localConnectIP: 169.254.0.1/30
  staticRoutes:
    - cidr: 172.31.0.0/16
      nextHopIP: 169.254.0.2
      policy: policyDst
---
kind: Vpc
apiVersion: kubeovn.io/v1
metadata:
  name: vpc-2
spec:
  vpcPeerings:
    - remoteVpc: vpc-1
      localConnectIP: 169.254.0.2/30
  staticRoutes:
    - cidr: 10.0.0.0/16
      nextHopIP: 169.254.0.1
      policy: policyDst
```

- remoteVpc: VPC
- localConnectIP: IP CIDR IP CIDR
- cidr Subnet CIDR
- nextHopIP VPC localConnectIP

## Subnet Pod

```
apiVersion: v1
kind: Pod
metadata:
  annotations:
    ovn.kubernetes.io/logical_switch: net1
  name: vpc-1-pod
spec:
  containers:
    - name: vpc-1-pod
      image: docker.io/library/nginx:alpine
---
apiVersion: v1
kind: Pod
metadata:
  annotations:
    ovn.kubernetes.io/logical_switch: net2
  name: vpc-2-pod
spec:
  containers:
    - name: vpc-2-pod
      image: docker.io/library/nginx:alpine
```

```
# kubectl exec -it vpc-1-pod -- ping $(kubectl get pod vpc-2-pod -o jsonpath='{.status.podIP}')
PING 172.31.0.2 (172.31.0.2): 56 data bytes
64 bytes from 172.31.0.2: seq=0 ttl=62 time=0.655 ms
64 bytes from 172.31.0.2: seq=1 ttl=62 time=0.886 ms
64 bytes from 172.31.0.2: seq=2 ttl=62 time=0.098 ms
^C
--- 172.31.0.2 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.086/0.279/0.655 ms
# kubectl exec -it vpc-2-pod -- ping $(kubectl get pod vpc-1-pod -o jsonpath='{.status.podIP}')
PING 10.0.0.2 (10.0.0.2): 56 data bytes
64 bytes from 10.0.0.2: seq=0 ttl=62 time=0.594 ms
64 bytes from 10.0.0.2: seq=1 ttl=62 time=0.093 ms
64 bytes from 10.0.0.2: seq=2 ttl=62 time=0.088 ms
^C
--- 10.0.0.2 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.088/0.258/0.594 ms
```

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5.9.3

## 6.

---

### 6.1 kubectl

Kube-OVN    kubectl    OVN    OVN    OVS    tcpdump

#### 6.1.1

Kube-OVN    kubectl

kubectl-ko

```
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/release-1.15/dist/images/kubectl-ko
```

\$PATH

```
mv kubectl-ko /usr/local/bin/kubectl-ko
```

```
chmod +x /usr/local/bin/kubectl-ko
```

```
# kubectl plugin list
The following compatible plugins are available:
/usr/local/bin/kubectl-ko
```

#### 6.1.2

kubectl ko

```
# kubectl ko
kubectl ko {subcommand} [option...]
Available Subcommands:
[nb|sb] [status|kick|backup|dbstatus|restore]      ovn-db operations show cluster status, kick stale server, backup database, get db consistency status or
restore ovn nb db when met 'inconsistent data' error
nbctl [ovn-nbctl options ...]   invoke ovn-nbctl
sbctl [ovn-sbctl options ...]   invoke ovn-sbctl
vsctl {node_name} [ovs-vsctl options ...]   invoke ovs-vsctl on the specified node
ofctl {node_name} [ovs-ofctl options ...]   invoke ovs-ofctl on the specified node
dpctl {node_name} [ovs-dpctl options ...]   invoke ovs-dpctl on the specified node
appctl {node_name} [ovs-appctl options ...]   invoke ovs-appctl on the specified node
tcpdump {namespace/podname} [tcpdump options ...]   capture pod traffic
{trace|ovn-trace} ...   trace ovn microflow of specific packet
  {trace|ovn-trace} {namespace/podname} {target ip address} [target mac address] {icmp|tcp|udp} [target tcp/udp port]   trace ICMP/TCP/UDP
  {trace|ovn-trace} {namespace/podname} {target ip address} [target mac address] arp {request|reply}   trace ARP request/reply
  {trace|ovn-trace} {node//node_name} {target ip address} [target mac address] {icmp|tcp|udp} [target tcp/udp port]   trace ICMP/TCP/UDP
  {trace|ovn-trace} {node//node_name} {target ip address} [target mac address] arp {request|reply}   trace ARP request/reply
diagnose {all|node|subnet|IPPorts} [{node_name|subnet_name|proto1}-{IP1}-{Port1},{proto2}-{IP2}-{Port2}]   diagnose connectivity of all nodes or a specific
node or specify subnet's ds pods or IPPorts like 'tcp-172.18.0.2-53,udp-172.18.0.3-53'
env-check   check the environment configuration
reload   restart all kube-ovn components
log {kube-ovn|ovn|ovs|linux|all}   save log to ./kubectl-ko-log/
perf [image] performance test default image is docker.io/kubeovn/test:v1.13.0
icnbctl [ovn-nbctl options ...]   invoke ovn-ic-nbctl
icsbctl [ovn-sbctl options ...]   invoke ovn-ic-sbctl
```

**[nb | sb] [status | kick | backup | dbstatus | restore]**

OVN

OVN leader ovs-appctl cluster/status :

```
# kubectl ko nb status
306b
Name: OVN_Northbound
Cluster ID: 9a87 (9a872522-3e7d-47ca-83a3-d74333e1a7ca)
Server ID: 306b (306b256b-b5e1-4eb0-be91-4ca96adf6bad)
Address: tcp:[172.18.0.2]:6643
Status: cluster member
Role: leader
Term: 1
Leader: self
Vote: self

Last Election started 280309 ms ago, reason: timeout
Last Election won: 280309 ms ago
Election timer: 5000
Log: [139, 139]
Entries not yet committed: 0
Entries not yet applied: 0
Connections: <-8723 ->8723 <-85d6 ->85d6
Disconnections: 0
Servers:
  85d6 (85d6 at tcp:[172.18.0.4]:6643) next_index=139 match_index=138 last msg 763 ms ago
  8723 (8723 at tcp:[172.18.0.3]:6643) next_index=139 match_index=138 last msg 763 ms ago
  306b (306b at tcp:[172.18.0.2]:6643) (self) next_index=2 match_index=138
status: ok
```

Server match\_index last msg Server

OVN 172.18.0.3 :

```
# kubectl ko nb kick 8723
started removal
```

```
# kubectl ko nb status
306b
Name: OVN_Northbound
Cluster ID: 9a87 (9a872522-3e7d-47ca-83a3-d74333e1a7ca)
Server ID: 306b (306b256b-b5e1-4eb0-be91-4ca96adf6bad)
Address: tcp:[172.18.0.2]:6643
Status: cluster member
Role: leader
Term: 1
Leader: self
Vote: self

Last Election started 324356 ms ago, reason: timeout
Last Election won: 324356 ms ago
Election timer: 5000
Log: [140, 140]
Entries not yet committed: 0
Entries not yet applied: 0
Connections: <-85d6 ->85d6
Disconnections: 2
Servers:
  85d6 (85d6 at tcp:[172.18.0.4]:6643) next_index=140 match_index=139 last msg 848 ms ago
  306b (306b at tcp:[172.18.0.2]:6643) (self) next_index=2 match_index=139
status: ok
```

OVN

```
# kubectl ko nb backup
tar: Removing leading '/' from member names
backup ovn-nb db to /root/ovnnb_db.060223191654183154.backup
```

```
# kubectl ko nb dbstatus
status: ok
```

inconsistent data

### inconsistent data

```
# kubectl ko nb restore
deployment.apps/ovn-central scaled
ovn-central original replicas is 3
first nodeIP is 172.18.0.5
ovs-ovn pod on node 172.18.0.5 is ovs-ovn-8jxv9
ovs-ovn pod on node 172.18.0.3 is ovs-ovn-sjzb6
ovs-ovn pod on node 172.18.0.4 is ovs-ovn-t87zk
backup nb db file
restore nb db file, operate in pod ovs-ovn-8jxv9
deployment.apps/ovn-central scaled
finish restore nb db file and ovn-central replicas
recreate ovs-ovn pods
pod "ovs-ovn-8jxv9" deleted
pod "ovs-ovn-sjzb6" deleted
pod "ovs-ovn-t87zk" deleted
```

### [nbctl | sbctl] [options ...]

OVN

leader

ovn-nbctl ovn-sbctl

OVN

ovn-nbctl(8) ovn-sbctl(8)

```
# kubectl ko nbctl show
switch c7cd17e8-ceee-4a91-9bb3-e5a313fe1ece (snat)
  port snat-ovn-cluster
    type: router
    router-port: ovn-cluster-snat
switch 20e0c6d0-023a-4756-aec5-200e0c60f95d (join)
  port node-liumengxin-ovn3-192.168.137.178
    addresses: ["00:00:00:64:FF:A8 100.64.0.4"]
  port node-liumengxin-ovn1-192.168.137.176
    addresses: ["00:00:00:AF:98:62 100.64.0.2"]
  port node-liumengxin-ovn2-192.168.137.177
    addresses: ["00:00:00:D9:58:B8 100.64.0.3"]
  port join-ovn-cluster
    type: router
    router-port: ovn-cluster-join
switch 0191705c-f827-427b-9de3-3c3b7d971ba5 (central)
  port central-ovn-cluster
    type: router
    router-port: ovn-cluster-central
switch 2a45ff05-388d-4f85-9daf-e6fcfd5833dc (ovn-default)
  port alertmanager-main-0.monitoring
    addresses: ["00:00:00:6C:DF:A3 10.16.0.19"]
  port kube-state-metrics-5d6885d89-4nf8h.monitoring
    addresses: ["00:00:00:6F:02:1C 10.16.0.15"]
  port fake-kubelet-67c55dfdf89-pv86k.kube-system
    addresses: ["00:00:00:5C:12:E8 10.16.19.177"]
  port ovn-default-ovn-cluster
    type: router
    router-port: ovn-cluster-ovn-default
router 212f73dd-d63d-4d72-864b-a537e9afbee1 (ovn-cluster)
  port ovn-cluster-snat
    mac: "00:00:00:7A:82:8F"
    networks: ["172.22.0.1/16"]
  port ovn-cluster-join
    mac: "00:00:00:F8:18:5A"
    networks: ["100.64.0.1/16"]
  port ovn-cluster-central
    mac: "00:00:00:4D:8C:F5"
    networks: ["192.168.0.1/16"]
  port ovn-cluster-ovn-default
    mac: "00:00:00:A3:F8:18"
    networks: ["10.16.0.1/16"]
```

### vsctl {nodeName} [options ...]

nodeName ovs-ovn

ovs-vsctl

vswitchd

OVS

ovs-vsctl(8)

```
# kubectl ko vsctl kube-ovn-01 show
0d4c4675-c9cc-440a-8c1a-878e17f81b88
Bridge br-int
  fail_mode: secure
  datapath_type: system
  Port a2c1a8a8b83a_h
    Interface a2c1a8a8b83a_h
    Port "4fa5c4cbb1a5_h"
      Interface "4fa5c4cbb1a5_h"
  Port ovn-eef07d-0
    Interface ovn-eef07d-0
      type: stt
      options: {csum="true", key=flow, remote_ip="192.168.137.178"}
  Port ovn0
```

```

Interface ovn0
    type: internal
Port mirror0
    Interface mirror0
        type: internal
Port ovn-efa253-0
    Interface ovn-efa253-0
        type: stt
        options: {csum="true", key=flow, remote_ip="192.168.137.177"}
Port br-int
    Interface br-int
        type: internal
ovs_version: "2.17.2"

```

**ofctl {nodeName} [options ...]**

| nodeName | ovs-ovn | ovs-ofctl | OpenFlow | OVS | ovs-ofctl(8) |
|----------|---------|-----------|----------|-----|--------------|
|----------|---------|-----------|----------|-----|--------------|

```

# kubectl ko ofctl kube-ovn-01 dump-flows br-int
NXST_FLOW reply (xid=0x4): flags=[more]
cookie=0xcf3429e6, duration=671791.432s, table=0, n_packets=0, n_bytes=0, idle_age=65534, hard_age=65534, priority=100, in_port=2 actions=load:0x4->NXM_NX_REG13[], load:0x9->NXM_NX_REG11[], load:0xb->NXM_NX_REG12[], load:0x4->0XM_OF_METADATA[], load:0x1->NXM_NX_REG14[], resubmit(.8)
cookie=0xc91413c6, duration=671791.431s, table=0, n_packets=9978275, n_bytes=99978275, idle_age=0, hard_age=65534, priority=100, in_port=7 actions=load:0x1->NXM_NX_REG13[], load:0x9->NXM_NX_REG11[], load:0xb->NXM_NX_REG12[], load:0x4->0XM_OF_METADATA[], load:0x4->NXM_NX_REG14[], resubmit(.8)
cookie=0xf180459, duration=671791.431s, table=0, n_packets=17348582, n_bytes=2667811214, idle_age=0, hard_age=65534, priority=100, in_port=6317 actions=load:0xa->NXM_NX_REG13[], load:0x9->NXM_NX_REG11[], load:0xb->NXM_NX_REG12[], load:0x4->0XM_OF_METADATA[], load:0x9->NXM_NX_REG14[], resubmit(.8)
cookie=0x7806dd90, duration=671791.431s, table=0, n_packets=3235428, n_bytes=833821312, idle_age=0, hard_age=65534, priority=100, in_port=1 actions=load:0xd->NXM_NX_REG13[], load:0x9->NXM_NX_REG11[], load:0xb->NXM_NX_REG12[], load:0x4->0XM_OF_METADATA[], load:0x3->NXM_NX_REG14[], resubmit(.8)
...

```

**dpctl {nodeName} [options ...]**

| nodeName | ovs-ovn | ovs-dpctl | OVS datapath | OVS | ovs-dpctl(8) |
|----------|---------|-----------|--------------|-----|--------------|
|----------|---------|-----------|--------------|-----|--------------|

```

# kubectl ko dpctl kube-ovn-01 show
system@ovs-system:
lookups: hit:35080505 missed:21983648 lost:7:
flows: 105
masks: hit:1970748791 total:22 hit/pkt:5.29
port 0: ovs-system (internal)
port 1: ovn0 (internal)
port 2: mirror0 (internal)
port 3: br-int (internal)
port 4: stt_sys_7471 (stt: packet_type=ptap)
port 5: eeb4d9e51b5d_h
port 6: a2c1a8a8b83a_h
port 7: 4fa5c4cbb1a5_h

```

**appctl {nodeName} [options ...]**

| nodeName | ovs-ovn | ovs-appctl | daemon | OVS | ovs-appctl(8) |
|----------|---------|------------|--------|-----|---------------|
|----------|---------|------------|--------|-----|---------------|

```

# kubectl ko appctl kube-ovn-01 vlog/list
      console   syslog   file
      -----  -----
backtrace     OFF      ERR      INFO
bfd          OFF      ERR      INFO
bond         OFF      ERR      INFO
bridge        OFF      ERR      INFO
bundle        OFF      ERR      INFO
bundles       OFF      ERR      INFO
...

```

**tcpdump {namespace/podname} [tcpdump options ...]**

| namespace/podname | kube-ovn-cni | tcpdump | veth |
|-------------------|--------------|---------|------|
|-------------------|--------------|---------|------|

```

# kubectl ko tcpdump default/ds1-l6n7p icmp
+ kubectl exec -it kube-ovn-cni-wlg4s -n kube-ovn -- tcpdump -nn -i d7176fe7b4e0_h icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on d7176fe7b4e0_h, link-type EN10MB (Ethernet), capture size 262144 bytes
06:52:36.619688 IP 10.64.0.3 > 10.16.0.4: ICMP echo request, id 2, seq 1, length 64
06:52:36.619746 IP 10.16.0.4 > 100.64.0.3: ICMP echo reply, id 2, seq 1, length 64
06:52:37.619588 IP 100.64.0.3 > 10.16.0.4: ICMP echo request, id 2, seq 2, length 64
06:52:37.619630 IP 10.16.0.4 > 100.64.0.3: ICMP echo reply, id 2, seq 2, length 64
06:52:38.619933 IP 100.64.0.3 > 10.16.0.4: ICMP echo request, id 2, seq 3, length 64
06:52:38.619973 IP 10.16.0.4 > 100.64.0.3: ICMP echo reply, id 2, seq 3, length 64

```

## trace [arguments ...]

|     |     |          |
|-----|-----|----------|
| Pod | OVN | Openflow |
|-----|-----|----------|

```
kubectl ko trace {namespace/podname} {target ip address} [target mac address] {icmp|tcp|udp} [target tcp/udp port]
kubectl ko trace {namespace/podname} {target ip address} [target mac address] arp {request|reply}
kubectl ko trace {node/nodename} {target ip address} [target mac address] {icmp|tcp|udp} [target tcp/udp port]
kubectl ko trace {node/nodename} {target ip address} [target mac address] arp {request|reply}
```

```
# kubectl ko trace default/ds1-16n7p 8.8.8.8 icmp
+ kubectl exec ovn-central-5bc494cb5-n kube-ovn -- ovn-trace --ct=new ovn-default 'inport == "ds1-16n7p.default" && ip.ttl == 64 && icmp && eth.src == 0a:00:00:10:00:05 && ip4.src == 10.16.0.4 && eth.dst == 00:00:00:B8:CA:43 && ip4.dst == 8.8.8.8'
# icmp,reg14=0xf,vlan_tci=0x0000,d1_src=0a:00:00:10:00:05,d1_dst=00:00:00:B8:CA:43,nw_src=10.16.0.4,nw_dst=8.8.8.8,nw_tos=0,nw_ecn=0,nw_ttl=64,icmp_type=0,icmp_code=0

ingress(dp="ovn-default", inport="ds1-16n7p.default")
-----
0. ls_in_port_sec_l2 (ovn-northd.c:4143): inport == "ds1-16n7p.default" && eth.src == {0a:00:00:10:00:05}, priority 50, uuid 39453393
next;
1. ls_in_port_sec_ip (ovn-northd.c:2898): inport == "ds1-16n7p.default" && eth.src == 0a:00:00:10:00:05 && ip4.src == {10.16.0.4}, priority 90, uuid 81bcd485
next;
3. ls_in_pre_acl (ovn-northd.c:3269): ip, priority 100, uuid 7b4f4971
    reg0[0] = 1;
next;
5. ls_in_pre_stateful (ovn-northd.c:3396): reg0[0] == 1, priority 100, uuid 36cd577
    ct_next;

ct_next(ct_state=new|trk)
-----
6. ls_in_acl (ovn-northd.c:3759): ip && (!ct.est || (ct.est && ct_label.blocked == 1)), priority 1, uuid 7608af5b
    reg0[1] = 1;
next;
10. ls_in_stateful (ovn-northd.c:3995): reg0[1] == 1, priority 100, uuid 2aba1b90
    ct_commit(ct_label=0x01);
next;
16. ls_in_l2_1kup (ovn-northd.c:4470): eth.dst == 00:00:00:B8:CA:43, priority 50, uuid 5c9c3c9f
    output = "ovn-default-ovn-cluster";
output;
...
...
```

|       |          |     |
|-------|----------|-----|
| trace | Underlay | Mac |
|-------|----------|-----|

```
kubectl ko trace default/virt-handler-7lvm1 8.8.8.8 82:7c:9f:83:8c:01 icmp
```

## diagnose {all|node|subnet|IPPorts} [nodename|subnetName|{proto1}-{IP1}-{Port1},{proto2}-{IP2}-{Port2}]

kube-ovn-pinger

```
# kubectl ko diagnose all
switch c7cd17e8-ceee-4a91-9bb3-e5a313fe1ece (snat)
  port snat-ovn-cluster
    type: router
    router-port: ovn-cluster-snat
switch 20e0c6d0-023a-4756-aec5-200e0c60f95d (join)
  port node-liumengxin-ovn3-192.168.137.178
    addresses: ["00:00:00:64:FF:A8 100.64.0.4"]
  port node-liumengxin-ovn1-192.168.137.176
    addresses: ["00:00:00:AF:98:62 100.64.0.2"]
  port join-ovn-cluster
    type: router
    router-port: ovn-cluster-join
switch 0191705c-f827-427b-9de3-3c3b7d971ba5 (central)
  port central-ovn-cluster
    type: router
    router-port: ovn-cluster-central
switch 2a45ff05-388d-4f85-9daf-e6fccd5833dc (ovn-default)
  port ovn-default-ovn-cluster
    type: router
    router-port: ovn-cluster-ovn-default
  port prometheus-k8s-1.monitoring
    addresses: ["00:00:00:AA:37:DF 10.16.0.23"]
router 212f73dd-d63d-4d72-864b-a537e9afbee1 (ovn-cluster)
  port ovn-cluster-snats
    mac: "00:00:00:7A:82:8F"
    networks: ["172.22.0.1/16"]
  port ovn-cluster-join
    mac: "00:00:00:F8:18:5A"
    networks: ["100.64.0.1/16"]
  port ovn-cluster-central
```

```

mac: "00:00:00:4D:8C:F5"
networks: ["192.101.0.1/16"]
port ovn-cluster-ovn-default
  mac: "00:00:00:A3:F8:18"
  networks: ["10.16.0.1/16"]
Routing Policies
  31000 ip4.dst == 10.16.0.0/16 allow
  31000 ip4.dst == 100.64.0.0/16 allow
  30000 ip4.dst == 192.168.137.177 reroute 100.64.0.3
  30000 ip4.dst == 192.168.137.178 reroute 100.64.0.4
  29000 ip4.src == $ovn.default.fake.6_ip4 reroute 100.64.0.22
  29000 ip4.src == $ovn.default.fake.7_ip4 reroute 100.64.0.21
  29000 ip4.src == $ovn.default.fake.8_ip4 reroute 100.64.0.23
  29000 ip4.src == $ovn.default.liumengxin.ovn3.192.168.137.178_ip4 reroute 100.64.0.4
  20000 ip4.src == $ovn.default.liumengxin.ovn1.192.168.137.176_ip4 & ip4.dst != $ovn.cluster.overlay.subnets.IPv4 reroute 100.
64.0.2
  20000 ip4.src == $ovn.default.liumengxin.ovn2.192.168.137.177_ip4 & ip4.dst != $ovn.cluster.overlay.subnets.IPv4 reroute 100.
64.0.3
  20000 ip4.src == $ovn.default.liumengxin.ovn3.192.168.137.178_ip4 & ip4.dst != $ovn.cluster.overlay.subnets.IPv4 reroute 100.
64.0.4
IPv4 Routes
Route Table <main>:
  0.0.0.0/0      100.64.0.1 dst-ip
UUID          LB           PROTO      VIP          IPs
e9bcfd9d-793e-4431-9073-6dec96b75d71  cluster-tcp-load  tcp        10.100.209.132:10660  192.168.137.176:10660
                                         tcp        10.101.239.192:6641   192.168.137.177:6641
                                         tcp        10.101.240.101:3000   10.16.0.7:3000
                                         tcp        10.103.184.186:6642   192.168.137.177:6642
35d2b7a5-e3a7-485a-a4b7-b4970eb0e63b  cluster-tcp-sess  tcp        10.100.158.128:8080  10.16.0.10:8080,10.16.0.5:8080,10.16.63.30:8080
                                         tcp        10.107.26.215:8080  10.16.0.19:8080,10.16.0.20:8080,10.16.0.21:8080
                                         tcp        10.107.26.215:9093  10.16.0.19:9093,10.16.0.20:9093,10.16.0.21:9093
                                         tcp        10.98.187.99:8080  10.16.0.22:8080,10.16.0.23:8080
                                         tcp        10.98.187.99:9090  10.16.0.22:9090,10.16.0.23:9090
f43303e4-89aa-4d3e-a3dc-278a552fe27b  cluster-udp-load  udp        10.96.0.10:53    10.16.0.4:53,10.16.0.9:53
_uuid          : 06776304-5a96-43ed-90c4-c4854c251699
addresses       : []
external_ids     : {vendor=kube-ovn}
name            : node_liumengxin_ovn2_192.168.137.177_underlay_v6

_uuid          : 62690625-87d5-491c-8675-9fd83b1f433c
addresses       : []
external_ids     : {vendor=kube-ovn}
name            : node_liumengxin_ovn1_192.168.137.176_underlay_v6

_uuid          : b03a9bae-94d5-4562-b34c-b5f6198e180b
addresses       : ["10.16.0.0/16", "100.64.0.0/16", "172.22.0.0/16", "192.101.0.0/16"]
external_ids     : {vendor=kube-ovn}
name            : ovn.cluster.overlay.subnets.IPv4

_uuid          : e1056f3a-24cc-4666-8a91-75ee6c3c2426
addresses       : []
external_ids     : {vendor=kube-ovn}
name            : ovn.cluster.overlay.subnets.IPv6

_uuid          : 3e5dffff-e670-47b2-a2f5-a39f4698a8c5
addresses       : []
external_ids     : {vendor=kube-ovn}
name            : node_liumengxin_ovn3_192.168.137.178_underlay_v6
_uuid          : 2d85dbdc-d0db-4abe-b19e-cc886d32b492
action          : drop
direction        : from-lport
external_ids     : {}
label            : 0
log              : false
match            : "inport==@ovn.sg.kubeovn_deny_all && ip"
meter            : []
name             : []
options          : {}
priority         : 2003
severity         : []

_uuid          : de790cc8-f155-405f-bb32-5a51f30c545f
action          : drop
direction        : to-lport
external_ids     : {}
label            : 0
log              : false
match            : "outport==@ovn.sg.kubeovn_deny_all && ip"
meter            : []
name             : []
options          : {}
priority         : 2003
severity         : []

Chassis "e15ed4d4-1780-4d50-b09e-ea8372ed48b8"
  hostname: liumengxin-ovn1-192.168.137.176
  Encap stt
    ip: "192.168.137.176"
    options: {csum="true"}
  Port_Binding node-liumengxin-ovn1-192.168.137.176
  Port_Binding perf-6vxkn.default
  Port_Binding kube-state-metrics-5d6885d89-4nf8h.monitoring
  Port_Binding alertmanager-main-0.monitoring
  Port_Binding kube-ovn-pinger-6ftdf.kube-system
  Port_Binding fake-kubelet-67c55dfd89-pv86k.kube-system

```

```

Port_Binding prometheus-k8s-0.monitoring
Chassis "eef07da1-f8ad-4775-b14d-bd6a3b4eb0d5"
  hostname: liumengxin-ovn3-192.168.137.178
  Encap stt
    ip: "192.168.137.178"
    options: {csum="true"}
Port_Binding kube-ovn-pinger-7twb4.kube-system
Port_Binding prometheus-adapter-86df476d87-r188g.monitoring
Port_Binding prometheus-k8s-1.monitoring
Port_Binding node-liumengxin-ovn3-192.168.137.178
Port_Binding perf-ff475.default
Port_Binding alertmanager-main-1.monitoring
Port_Binding blackbox-exporter-676d976865-tvsjd.monitoring
Chassis "efa253c9-494d-4719-83ae-b48ab0f11c03"
  hostname: liumengxin-ovn2-192.168.137.177
  Encap stt
    ip: "192.168.137.177"
    options: {csum="true"}
Port_Binding grafana-6c4c6b8fb7-pzd2c.monitoring
Port_Binding node-liumengxin-ovn2-192.168.137.177
Port_Binding alertmanager-main-2.monitoring
Port_Binding coredns-6789c94dd8-9jqsz.kube-system
Port_Binding coredns-6789c94dd8-25d4r.kube-system
Port_Binding prometheus-operator-7bbc99fc8b-wgjm4.monitoring
Port_Binding prometheus-adapter-86df476d87-gdxmc.monitoring
Port_Binding perf-fjnws.default
Port_Binding kube-ovn-pinger-vh2xg.kube-system
ds kube-proxy ready
kube-proxy ready
deployment ovn-central ready
deployment kube-ovn-controller ready
ds kube-ovn-cni ready
ds ovs-ovn ready
deployment coredns ready
ovn-nb leader check ok
ovn-sb leader check ok
ovn-northd leader check ok
### kube-ovn-controller recent log

### start to diagnose node liumengxin-ovn1-192.168.137.176
##### ovn-controller log:
2022-06-03T00:56:44.897Z|16722|inc_proc_eng|INFO|User triggered force recompute.
2022-06-03T01:06:44.912Z|16723|inc_proc_eng|INFO|User triggered force recompute.
2022-06-03T01:16:44.925Z|16724|inc_proc_eng|INFO|User triggered force recompute.
2022-06-03T01:26:44.936Z|16725|inc_proc_eng|INFO|User triggered force recompute.
2022-06-03T01:36:44.959Z|16726|inc_proc_eng|INFO|User triggered force recompute.
2022-06-03T01:46:44.974Z|16727|inc_proc_eng|INFO|User triggered force recompute.
2022-06-03T01:56:44.988Z|16728|inc_proc_eng|INFO|User triggered force recompute.
2022-06-03T02:06:45.001Z|16729|inc_proc_eng|INFO|User triggered force recompute.
2022-06-03T02:16:45.025Z|16730|inc_proc_eng|INFO|User triggered force recompute.
2022-06-03T02:26:45.040Z|16731|inc_proc_eng|INFO|User triggered force recompute.

##### ovs-vsctl log:
2022-06-02T23:03:00.137Z|00079|dpif(handler)|WARN|system@ovs-system: execute ct(commit,zone=14,label=0/0x1,nat(src)),8 failed (Invalid argument) on packet
  icmp,vlan_tci=0x0000,dl_src=00:00:00:f8:07:c8,dl_dst=00:00:00:fa:1e:50,nw_src=10.16.0.5,nw_dst=10.16.0.10,nw_tos=0,nw_ecn=0,nw_ttl=64,icmp_type=8,icmp_code=0
  icmp_csum=f9d1
  with metadata skb_priority(0),tunnel(tun_id=0x160017000004,src=192.168.137.177,dst=192.168.137.176,ttl=64,tp_src=38881,tp_dst=7471,flags(csum|key)),skb_mark(0),ct_state(0x21),ct_zone(0xe),ct_tuple4(src=10.16.0.5,dst=10.16.0.10,proto=1,tp_src=8,tp_dst=0),in_port(4) mtu 0
2022-06-02T23:23:31.840Z|00080|dpif(handler)|WARN|system@ovs-system: execute ct(commit,zone=14,label=0/0x1,nat(src)),8 failed (Invalid argument) on packet
  icmp,vlan_tci=0x0000,dl_src=00:00:00:f8:07:c8,dl_dst=00:00:00:fa:1e:50,nw_src=10.16.0.5,nw_dst=10.16.0.10,nw_tos=0,nw_ecn=0,nw_ttl=64,icmp_type=8,icmp_code=0
  icmp_csum=15b2
  with metadata skb_priority(0),tunnel(tun_id=0x160017000004,src=192.168.137.177,dst=192.168.137.176,ttl=64,tp_src=38881,tp_dst=7471,flags(csum|key)),skb_mark(0),ct_state(0x21),ct_zone(0xe),ct_tuple4(src=10.16.0.5,dst=10.16.0.10,proto=1,tp_src=8,tp_dst=0),in_port(4) mtu 0
2022-06-03T00:09:15.659Z|00081|dpif(handler)|WARN|system@ovs-system: execute ct(commit,zone=14,label=0/0x1,nat(src)),8 failed (Invalid argument) on packet
  icmp,vlan_tci=0x0000,dl_src=00:00:00:dc:a3:63,dl_dst=00:00:00:fa:1e:50,nw_src=10.16.63.30,nw_dst=10.
16.0.10,nw_tos=0,nw_ecn=0,nw_ttl=64,icmp_type=8,icmp_code=0 icmp_csum=e5a5
  with metadata skb_priority(0),tunnel(tun_id=0x150017000004,src=192.168.137.178,dst=192.168.137.176,ttl=64,tp_src=9239,tp_dst=7471,flags(csum|key)),skb_mark(0),ct_state(0x21),ct_zone(0xe),ct_tuple4(src=10.16.0.10,dst=10.16.0.10,proto=1,tp_src=8,tp_dst=0),in_port(4) mtu 0
2022-06-03T00:30:13.409Z|00084|dpif(handler2)|WARN|system@ovs-system: execute ct(commit,zone=14,label=0/0x1,nat(src)),8 failed (Invalid argument) on packet
  icmp,vlan_tci=0x0000,dl_src=00:00:00:f8:07:c8,dl_dst=00:00:00:fa:1e:50,nw_src=10.16.0.5,nw_dst=10.16.0.10,nw_tos=0,nw_ecn=0,nw_ttl=64,icmp_type=8,icmp_code=0
  icmp_csum=6b4a
  with metadata skb_priority(0),tunnel(tun_id=0x160017000004,src=192.168.137.177,dst=192.168.137.176,ttl=64,tp_src=38881,tp_dst=7471,flags(csum|key)),skb_mark(0),ct_state(0x21),ct_zone(0xe),ct_tuple4(src=10.16.0.5,dst=10.16.0.10,proto=1,tp_src=8,tp_dst=0),in_port(4) mtu 0
2022-06-03T02:03:23.832Z|00082|dpif(handler1)|WARN|system@ovs-system: execute ct(commit,zone=14,label=0/0x1,nat(src)),8 failed (Invalid argument) on packet
  icmp,vlan_tci=0x0000,dl_src=00:00:00:f8:07:c8,dl_dst=00:00:00:fa:1e:50,nw_src=10.16.0.5,nw_dst=10.16.0.10,nw_tos=0,nw_ecn=0,nw_ttl=64,icmp_type=8,icmp_code=0
  icmp_csum=a819
  with metadata skb_priority(0),tunnel(tun_id=0x160017000004,src=192.168.137.177,dst=192.168.137.176,ttl=64,tp_src=38881,tp_dst=7471,flags(csum|key)),skb_mark(0),ct_state(0x21),ct_zone(0xe),ct_tuple4(src=10.16.0.5,dst=10.16.0.10,proto=1,tp_src=8,tp_dst=0),in_port(4) mtu 0

##### ovs-vsctl show results:
0d4c4675-c9cc-448a-8c1a-878e17f81b88
Bridge br-int
  fail_mode: secure
  datapath_type: system
  Port a2c1a8a8b83a_h
    Interface a2c1a8a8b83a_h
      "4fa5c4ccb1a5_h"
    Interface "4fa5c4ccb1a5_h"
  Port ovn-eef07d-0
    Interface ovn-eef07d-0
      type: stt
      options: {csum="true", key=flow, remote_ip="192.168.137.178"}
  Port ovn0
    Interface ovn0

```

```

        type: internal
Port "04d03360e9a0_h"
    Interface "04d03360e9a0_h"
Port eeb4d9e51b5d_h
    Interface eeb4d9e51b5d_h
Port mirror0
    Interface mirror0
        type: internal
Port "8e5d887cc80_h"
    Interface "8e5d887cc80_h"
Port ovn-efa253-0
    Interface ovn-efa253-0
        type: stt
        options: {csum="true", key=flow, remote_ip="192.168.137.177"}
Port "17512d5be1f1_h"
    Interface "17512d5be1f1_h"
Port br-int
    Interface br-int
        type: internal
ovs_version: "2.17.2"

#### pinger diagnose results:
I0603 10:35:04.349404 17619 pinger.go:19]

Kube-OVN:
Version: v1.15.0
Build: 2022-04-24_08:02:50
Commit: git-73f9d15
Go Version: go1.17.8
Arch: amd64

I0603 10:35:04.376797 17619 config.go:166] pinger config is &{KubeConfigFile: KubeClient:0xc000493380 Port:8080 DaemonSetNameSpace:kube-system DaemonSetName:kube-ovn-pinger Interval:5 Mode:job ExitCode:0 InternalDNS:kubernetes.default ExternalDNS: NodeName:liumengxin-ovn1-192.168.137.176 HostIP:192.168.137.176 PodName:kube-ovn-pinger-6ftdf PodIP:10.16.0.10 PodProtocols:[IPv4] ExternalAddress: NetworkMode:kube-ovn PollTimeout:2 PollInterval:15 SystemRunDir:/var/run/openvswitch DatabaseVswitchName:Open_vSwitch DatabaseVswitchSocketRemote:unix:/var/run/openvswitch/db.sock DatabaseVswitchFilePath:/etc/openvswitch/conf.db DatabaseVswitchFileLogPath:/var/log/openvswitch/ovsdb-server.log DatabaseVswitchFilePidPath:/var/run/openvswitch/ovsdb-server.pid DatabaseVswitchFileSystemIDPath:/etc/openvswitch/system-id.conf ServiceVswitchchFileLogPath:/var/log/openvswitch/ovs-vswitchd.log ServiceVswitchchFilePidPath:/var/run/openvswitch/ovs-vswitchd.pid ServiceOvnControllerFileLogPath:/var/log/ovn/ovn-controller.log ServiceOvnControllerFilePidPath:/var/run/ovn-controller.pid}
I0603 10:35:04.449166 17619 exporter.go:75] liumengxin-ovn1-192.168.137.176: exporter connect successfully
I0603 10:35:04.554011 17619 ovn.go:21] ovs-vswitchd and ovsvdb are up
I0603 10:35:04.651293 17619 ovn.go:33] ovn_controller is up
I0603 10:35:04.651342 17619 ovn.go:39] start to check port binding
I0603 10:35:04.749613 17619 ovn.go:135] chassis id is 1d7f3d6c-eec5-4b3c-adca-2969d9cdfd80
I0603 10:35:04.763487 17619 ovn.go:49] port in sb is [node-liumengxin-ovn1-192.168.137.176 perf-6vxkn.default kube-state-metrics-5d6805d89-4nf8h.monitoring alertmanager-main-0.monitoring kube-ovn-pinger-6ftdf.kube-system fake-kubelet-67c55dfd89-pv86k.kube-system prometheus-k8s-0.monitoring]
I0603 10:35:04.763583 17619 ovn.go:61] ovs and ovn-sb binding check passed
I0603 10:35:05.049309 17619 ping.go:259] start to check apiserver connectivity
I0603 10:35:05.053666 17619 ping.go:268] connect to apiserver success in 4.27ms
I0603 10:35:05.053786 17619 ping.go:129] start to check pod connectivity
I0603 10:35:05.249590 17619 ping.go:159] ping pod: kube-ovn-pinger-6ftdf 10.16.0.10, count: 3, loss count 0, average rtt 16.30ms
I0603 10:35:05.354135 17619 ping.go:159] ping pod: kube-ovn-pinger-7wb4 10.16.63.30, count: 3, loss count 0, average rtt 1.81ms
I0603 10:35:05.458460 17619 ping.go:159] ping pod: kube-ovn-pinger-vh2xg 10.16.0.5, count: 3, loss count 0, average rtt 1.92ms
I0603 10:35:05.458523 17619 ping.go:83] start to check node connectivity

```

| diagnose | subnet  | subnet | daemonset | kube-ovn-pinger | daemonset | pod     | daemonset |
|----------|---------|--------|-----------|-----------------|-----------|---------|-----------|
| diagnose | IPPorts |        |           | kube-ovn-pinger |           | IP Port |           |

## reload

### Kube-OVN

```

# kubectl ko reload
pod "ovn-central-8684dd94bd-vzgr" deleted
Waiting for deployment "ovn-central" rollout to finish: 0 of 1 updated replicas are available...
deployment "ovn-central" successfully rolled out
pod "ovs-ovn-bsnvz" deleted
pod "ovs-ovn-m9b98" deleted
pod "kube-ovn-controller-8459db5ff4-64c62" deleted
Waiting for deployment "kube-ovn-controller" rollout to finish: 0 of 1 updated replicas are available...
deployment "kube-ovn-controller" successfully rolled out
pod "kube-ovn-cni-2klhn" deleted
pod "kube-ovn-cni-t2jz4" deleted
Waiting for daemon set "kube-ovn-cni" rollout to finish: 0 of 2 updated pods are available...
Waiting for daemon set "kube-ovn-cni" rollout to finish: 1 of 2 updated pods are available...
daemon set "kube-ovn-cni" successfully rolled out
pod "kube-ovn-pinger-ln72z" deleted
pod "kube-ovn-pinger-w8lrk" deleted
Waiting for daemon set "kube-ovn-pinger" rollout to finish: 0 of 2 updated pods are available...
Waiting for daemon set "kube-ovn-pinger" rollout to finish: 1 of 2 updated pods are available...
daemon set "kube-ovn-pinger" successfully rolled out
pod "kube-ovn-monitor-7fb67d5488-7q6zb" deleted
Waiting for deployment "kube-ovn-monitor" rollout to finish: 0 of 1 updated replicas are available...
deployment "kube-ovn-monitor" successfully rolled out

```

**log**

kube-ovn      Kube-OVN OVN Open vSwitch log linux debug

```
# kubectl ko log all
Collecting kube-ovn logging files
Collecting ovn logging files
Collecting openvswitch logging files
Collecting linux dmesg files
Collecting linux iptables-legacy files
Collecting linux iptables-nft files
Collecting linux route files
Collecting linux link files
Collecting linux neigh files
Collecting linux memory files
Collecting linux top files
Collecting linux sysctl files
Collecting linux netstat files
Collecting linux addr files
Collecting linux ipset files
Collecting linux tcp files
Collected files have been saved in the directory /root/kubectl-ko-log
```

```
# tree kubectl-ko-log/
kubectl-ko-log/
|-- kube-ovn-control-plane
|   |-- kube-ovn
|   |   |-- kube-ovn-cni.log
|   |   |-- kube-ovn-monitor.log
|   |   '-- kube-ovn-pinger.log
|   '-- linux
|       |-- addr.log
|       |-- dmesg.log
|       |-- ipset.log
|       |-- iptables-legacy.log
|       |-- iptables-nft.log
|       |-- link.log
|       |-- memory.log
|       |-- neigh.log
|       |-- netstat.log
|       |-- route.log
|       |-- sysctl.log
|       |-- tcp.log
|       '-- top.log
|   '-- openvswitch
|       |-- ovs-vswitchd.log
|       '-- ovsdb-server.log
|   '-- ovn
|       |-- ovn-controller.log
|       |-- ovn-northd.log
|       '-- ovsdb-server-nb.log
|           '-- ovsdb-server-sb.log
```

**perf [image]**

Kube-OVN

- 1.
2. Hostnetwork
- 3.
4. OVN-NB, OVN-SB, OVN-Northd leader

image      Pod      kubeovn/test:v1.12.0

```
# kubectl ko perf
===== Preparing Performance Test Resources =====
pod/test-client created
pod/test-host-client created
pod/test-server created
pod/test-host-server created
service/test-server created
pod/test-client condition met
pod/test-host-client condition met
pod/test-host-server condition met
pod/test-server condition met
=====
===== Start Pod Network Unicast Performance Test =====
Size      TCP Latency    TCP Bandwidth   UDP Latency     UDP Lost Rate   UDP Bandwidth
64        82.8 us        97.7 Mbits/sec  67.6 us        (0%)          8.42 Mbits/sec
128       85.4 us        167 Mbits/sec   67.2 us        (0%)          17.2 Mbits/sec
```

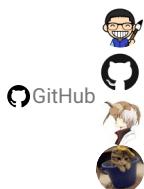
```

512      85.8 us    440 Mbits/sec  68.7 us      (0%)      68.4 Mbits/sec
1k       85.1 us    567 Mbits/sec  68.7 us      (0%)      134 Mbits/sec
4k       138 us     826 Mbits/sec  78.1 us     (1.4%)     503 Mbits/sec
=====
===== Start Host Network Performance Test =====
Size      TCP Latency   TCP Bandwidth   UDP Latency   UDP Lost Rate   UDP Bandwidth
64        49.7 us      120 Mbits/sec  37.9 us      (0%)      18.6 Mbits/sec
128       49.7 us      200 Mbits/sec  38.1 us      (0%)      35.5 Mbits/sec
512       51.9 us      588 Mbits/sec  38.9 us      (0%)      142 Mbits/sec
1k        51.7 us      944 Mbits/sec  37.2 us      (0%)      279 Mbits/sec
4k        74.9 us      1.66 Gbits/sec 39.9 us      (0%)      1.20 Gbits/sec
=====
===== Start Service Network Performance Test =====
Size      TCP Latency   TCP Bandwidth   UDP Latency   UDP Lost Rate   UDP Bandwidth
64        111 us       96.3 Mbits/sec  88.4 us      (0%)      7.59 Mbits/sec
128       83.7 us      150 Mbits/sec  69.2 us      (0%)      16.9 Mbits/sec
512       87.4 us      374 Mbits/sec  75.8 us      (0%)      60.9 Mbits/sec
1k        88.2 us      521 Mbits/sec  73.1 us      (0%)      123 Mbits/sec
4k        148 us       813 Mbits/sec  77.6 us     (0.0044%)    451 Mbits/sec
=====
===== Start Pod Multicast Network Performance Test =====
Size      UDP Latency   UDP Lost Rate   UDP Bandwidth
64        0.014 ms     (0.17%)      5.80 Mbits/sec
128      0.012 ms     (0%)         11.4 Mbits/sec
512      0.016 ms     (0%)         46.1 Mbits/sec
1k       0.023 ms     (0.073%)    89.8 Mbits/sec
4k       0.035 ms     (1.3%)       126 Mbits/sec
=====
===== Start Host Multicast Network Performance =====
Size      UDP Latency   UDP Lost Rate   UDP Bandwidth
64        0.007 ms     (0%)         9.95 Mbits/sec
128      0.005 ms     (0%)         21.8 Mbits/sec
512      0.008 ms     (0%)         86.8 Mbits/sec
1k       0.013 ms     (0.045%)    168 Mbits/sec
4k       0.010 ms     (0.31%)      242 Mbits/sec
=====
===== Start Leader Recover Time Test =====
Delete ovn central nb pod
pod "ovn-central-5cb9c67d75-tlz9w" deleted
Waiting for ovn central nb pod running
===== OVN nb Recovery takes 3.305236803 s =====
Delete ovn central sb pod
pod "ovn-central-5cb9c67d75-szx4c" deleted
Waiting for ovn central sb pod running
===== OVN sb Recovery takes 3.462698535 s =====
Delete ovn central northd pod
pod "ovn-central-5cb9c67d75-zqmqv" deleted
Waiting for ovn central northd pod running
===== OVN northd Recovery takes 2.691291403 s =====
=====
===== Remove Performance Test Resource =====
rm -f unicast-test-client.log
rm -f unicast-test-host-client.log
rm -f unicast-test-client.log
kubectl ko nbctl lb-del test-server
rm -f multicast-test-server.log
kubectl exec ovs-ovn-gxdrf -n kube-system -- ip maddr del 01:00:5e:00:00:64 dev eth0
kubectl exec ovs-ovn-h57bf -n kube-system -- ip maddr del 01:00:5e:00:00:64 dev eth0
rm -f multicast-test-host-server.log
pod "test-client" deleted
pod "test-host-client" deleted
pod "test-host-server" deleted
pod "test-server" deleted
service "test-server" deleted
=====
```

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## 6.1.3

## 6.2



### 6.2.1

```

# kubectl drain kube-ovn-worker --ignore-daemonsets --force
node/kube-ovn-worker cordoned
WARNING: ignoring DaemonSet-managed Pods: kube-system/kube-ovn-cni-zt74b, kube-system/kube-ovn-pinger-5rxf, kube-system/kube-proxy-jpmnm, kube-system/ovs-ovn-v2k11
evicting pod kube-system/coredns-64897985d-qsgpt
evicting pod local-path-storage/local-path-provisioner-5ddd94ff66-llss6
evicting pod kube-system/kube-ovn-controller-8459db5ff4-941xb
pod/kube-ovn-controller-8459db5ff4-941xb evicted
pod/coredns-64897985d-qsgpt evicted
pod/local-path-provisioner-5ddd94ff66-llss6 evicted
node/kube-ovn-worker drained
  
```

### 6.2.2 kubelet docker

```

ovs-ovn          ovn-central

systemctl stop kubelet
systemctl stop docker

CRI containerd      ovs-ovn

crictl rm -f $(crictl ps | grep openvswitch | awk '{print $1}')
  
```

### 6.2.3 Node

```

rm -rf /var/run/openvswitch
rm -rf /var/run/ovn
rm -rf /etc/origin/openvswitch/
rm -rf /etc/origin/ovn/
rm -rf /etc/cni/net.d/00-kube-ovn.conflist
rm -rf /etc/cni/net.d/01-kube-ovn.conflist
rm -rf /var/log/openvswitch
rm -rf /var/log/ovn
  
```

### 6.2.4 kubectl

```

kubectl delete no kube-ovn-01
  
```

### 6.2.5 ovn-sb

```

kube-ovn-worker

# kubectl ko sbctl show
Chassis "b0564934-5a0d-4804-a4c0-476c93596a17"
  hostname: kube-ovn-worker
  Encap geneve
    ip: "172.18.0.2"
    options: {csum="true"}
  Port_Binding kube-ovn-pinger-5rxf.kube-system
Chassis "6a29de7e-d731-4eaf-bacd-2f239ee52b28"
  hostname: kube-ovn-control-plane
  Encap geneve
    ip: "172.18.0.3"
    options: {csum="true"}
  Port_Binding coredns-64897985d-nbfln.kube-system
  Port_Binding node-kube-ovn-control-plane
  Port_Binding local-path-provisioner-5ddd94ff66-h4tn9.local-path-storage
  Port_Binding kube-ovn-pinger-hf2p6.kube-system
  Port_Binding coredns-64897985d-fhwlw.kube-system
  
```

## 6.2.6 chassis

uuid      Chassis    id

```
# kubectl ko sbctl chassis-del b0564934-5a0d-4804-a4c0-476c93596a17
# kubectl ko sbctl show
Chassis "6a29de7e-d731-4eaf-bacd-2f239ee52b28"
  hostname: kube-ovn-control-plane
  Encap geneve
    ip: "172.18.0.3"
    options: {csum="true"}
  Port_Binding coredns-64897985d-nbf1n.kube-system
  Port_Binding node-kube-ovn-control-plane
  Port_Binding local-path-provisioner-5dd94ff66-h4tn9.local-path-storage
  Port_Binding kube-ovn-pinger-hf2p6.kube-system
  Port_Binding coredns-64897985d-fhw1w.kube-system
```

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## 6.2.7

## 6.3 ovn-central

```
ovn-central  ovn-nb  ovn-sb      etcd  Raft      ovn-central
```

### 6.3.1 ovn-central

```
kube-ovn-control-plane2          ovn-central
```

```
# kubectl -n kube-system get pod -o wide | grep central
ovn-central-6bf58cbc97-2cdhg      1/1    Running   0           21m  172.18.0.3  kube-ovn-control-plane   <none>       <none>
ovn-central-6bf58cbc97-crmfp      1/1    Running   0           21m  172.18.0.5  kube-ovn-control-plane2  <none>       <none>
ovn-central-6bf58cbc97-lxmpl      1/1    Running   0           21m  172.18.0.4  kube-ovn-control-plane3  <none>       <none>
```

#### ovn-nb

ID

```
# kubectl ko nb status
1b9a
Name: OVN_Northbound
Cluster ID: 32ca (32ca07fb-739b-4257-b510-12fa18e7cce8)
Server ID: 1b9a (1b9a5d76-e69b-410c-8085-39943d0cd38c)
Address: tcp:[172.18.0.3]:6643
Status: cluster member
Role: leader
Term: 1
Leader: self
Vote: self

Last Election started 2135194 ms ago, reason: timeout
Last Election won: 2135188 ms ago
Election timer: 5000
Log: [135, 135]
Entries not yet committed: 0
Entries not yet applied: 0
Connections: <-d64b ->d64b <-4984 ->4984
Disconnections: 0
Servers:
  4984 (4984 at tcp:[172.18.0.4]:6643) next_index=135 match_index=134 last msg 1084 ms ago
  1b9a (1b9a at tcp:[172.18.0.3]:6643) (self) next_index=2 match_index=134
    d64b (d64b at tcp:[172.18.0.5]:6643) next_index=135 match_index=134 last msg 1084 ms ago
status: ok
```

```
kube-ovn-control-plane2  IP  172.18.0.5  ID  d64b  ovn-nb
```

```
# kubectl ko nb kick d64b
started removal
```

```
# kubectl ko nb status
1b9a
Name: OVN_Northbound
Cluster ID: 32ca (32ca07fb-739b-4257-b510-12fa18e7cce8)
Server ID: 1b9a (1b9a5d76-e69b-410c-8085-39943d0cd38c)
Address: tcp:[172.18.0.3]:6643
Status: cluster member
Role: leader
Term: 1
Leader: self
Vote: self

Last Election started 2297649 ms ago, reason: timeout
Last Election won: 2297643 ms ago
Election timer: 5000
Log: [136, 136]
Entries not yet committed: 0
Entries not yet applied: 0
Connections: <-4984 ->4984
Disconnections: 2
Servers:
  4984 (4984 at tcp:[172.18.0.4]:6643) next_index=136 match_index=135 last msg 1270 ms ago
  1b9a (1b9a at tcp:[172.18.0.3]:6643) (self) next_index=2 match_index=135
status: ok
```

**ovn-sb**

ovn-sb ID

```
kubectl ko sb status
3722
Name: OVN_Southbound
Cluster ID: d4bd (d4bd37a4-0400-499f-b4df-b4fd389780f0)
Server ID: 3722 (3722d5ae-2ced-4820-a6b2-8b744d11fb3e)
Address: tcp:[172.18.0.3]:6644
Status: cluster member
Role: leader
Term: 1
Leader: self
Vote: self

Last Election started 2395317 ms ago, reason: timeout
Last Election won: 2395316 ms ago
Election timer: 5000
Log: [130, 130]
Entries not yet committed: 0
Entries not yet applied: 0
Connections: <-e9f7 ->e9f7 <-6e84 ->6e84
Disconnections: 0
Servers:
  e9f7 (e9f7 at tcp:[172.18.0.5]:6644) next_index=130 match_index=129 last msg 1006 ms ago
  6e84 (6e84 at tcp:[172.18.0.4]:6644) next_index=130 match_index=129 last msg 1004 ms ago
  3722 (3722 at tcp:[172.18.0.3]:6644) (self) next_index=2 match_index=129
status: ok
```

kube-ovn-control-plane2 IP 172.18.0.5 ID e9f7 ovn-sb

```
# kubectl ko sb kick e9f7
started removal
```

```
# kubectl ko sb status
3722
Name: OVN_Southbound
Cluster ID: d4bd (d4bd37a4-0400-499f-b4df-b4fd389780f0)
Server ID: 3722 (3722d5ae-2ced-4820-a6b2-8b744d11fb3e)
Address: tcp:[172.18.0.3]:6644
Status: cluster member
Role: leader
Term: 1
Leader: self
Vote: self

Last Election started 2481636 ms ago, reason: timeout
Last Election won: 2481635 ms ago
Election timer: 5000
Log: [131, 131]
Entries not yet committed: 0
Entries not yet applied: 0
Connections: <-6e84 ->6e84
Disconnections: 2
Servers:
  6e84 (6e84 at tcp:[172.18.0.4]:6644) next_index=131 match_index=130 last msg 642 ms ago
  3722 (3722 at tcp:[172.18.0.3]:6644) (self) next_index=2 match_index=130
status: ok
```

**ovn-central**

ovn-central NODE\_IPS

```
kubectl label node kube-ovn-control-plane2 kube-ovn/role-
kubectl scale deployment -n kube-system ovn-central --replicas=2
kubectl set env deployment/ovn-central -n kube-system NODE_IPS="172.18.0.3,172.18.0.4"
kubectl rollout status deployment/ovn-central -n kube-system
```

**ovn-central**

ovs-ovn

```
# kubectl set env daemonset/ovs-ovn -n kube-system OVN_DB_IPS="172.18.0.3,172.18.0.4"
daemonset.apps/ovs-ovn env updated
# kubectl delete pod -n kube-system -lapp=ovs
pod "ovs-ovn-4f6jc" deleted
```

```

pod "ovs-ovn-csn2w" deleted
pod "ovs-ovn-mpbmb" deleted

kube-ovn-controller

# kubectl set env deployment/kube-ovn-controller -n kube-system OVN_DB_IPS="172.18.0.3,172.18.0.4"
deployment.apps/kube-ovn-controller env updated

# kubectl rollout status deployment/kube-ovn-controller -n kube-system
Waiting for deployment "kube-ovn-controller" rollout to finish: 1 of 3 updated replicas are available...
Waiting for deployment "kube-ovn-controller" rollout to finish: 2 of 3 updated replicas are available...
deployment "kube-ovn-controller" successfully rolled out

```

## kube-ovn-control-plane2

```
rm -rf /etc/origin/ovn
```

Kubernetes

## 6.3.2 ovn-central

Kubernetes ovn-central

```
/etc/origin/ovn ovnnb_db.db ovnsb_db.db
```

```
rm -rf /etc/origin/ovn
```

**ovn-central**

## ovn-central

```

# kubectl ko nb status
1b9a
Name: OVN_Northbound
Cluster ID: 32ca (32ca07fb-739b-4257-b510-12fa18e7cce8)
Server ID: 1b9a (1b9a5d76-e69b-410c-8085-39943d0cd38c)
Address: tcp:[172.18.0.3]:6643
Status: cluster member
Role: leader
Term: 44
Leader: self
Vote: self

Last Election started 1855739 ms ago, reason: timeout
Last Election won: 1855729 ms ago
Election timer: 5000
Log: [147, 147]
Entries not yet committed: 0
Entries not yet applied: 0
Connections: ->4984 <-4984
Disconnections: 0
Servers:
  4984 (4984 at tcp:[172.18.0.4]:6643) next_index=147 match_index=146 last msg 367 ms ago
  1b9a (1b9a at tcp:[172.18.0.3]:6643) (self) next_index=140 match_index=146
status: ok

# kubectl ko sb status
3722
Name: OVN_Southbound
Cluster ID: d4bd (d4bd37a4-0400-499f-b4df-b4fd389780f0)
Server ID: 3722 (3722d5ae-2ced-4820-a6b2-8b744d11fb3e)
Address: tcp:[172.18.0.3]:6644
Status: cluster member
Role: leader
Term: 33
Leader: self
Vote: self

Last Election started 1868589 ms ago, reason: timeout
Last Election won: 1868579 ms ago
Election timer: 5000
Log: [142, 142]
Entries not yet committed: 0

```

```
Entries not yet applied: 0
Connections: ->6e84 <-6e84
Disconnections: 0
Servers:
  6e84 (6e84 at tcp:[172.18.0.4]:6644) next_index=142 match_index=141 last msg 728 ms ago
    3722 (3722 at tcp:[172.18.0.3]:6644) (self) next_index=134 match_index=141
status: ok
```

**ovn-central**    **NODE\_IPS**

```
kubectl label node kube-ovn-control-plane2 kube-ovn/role=master
kubectl scale deployment -n kube-system ovn-central --replicas=3
kubectl set env deployment/ovn-central -n kube-system NODE_IPS="172.18.0.3,172.18.0.4,172.18.0.5"
kubectl rollout status deployment/ovn-central -n kube-system
```

**ovn-central****ovs-ovn**

```
# kubectl set env daemonset/ovs-ovn -n kube-system OVN_DB_IPS="172.18.0.3,172.18.0.4,172.18.0.5"
daemonset.apps/ovs-ovn env updated
# kubectl delete pod -n kube-system -lapp=ovs
pod "ovs-ovn-4f6jc" deleted
pod "ovs-ovn-csn2w" deleted
pod "ovs-ovn-mpbmb" deleted
```

**kube-ovn-controller**

```
# kubectl set env deployment/kube-ovn-controller -n kube-system OVN_DB_IPS="172.18.0.3,172.18.0.4,172.18.0.5"
deployment.apps/kube-ovn-controller env updated

# kubectl rollout status deployment/kube-ovn-controller -n kube-system
Waiting for deployment "kube-ovn-controller" rollout to finish: 1 of 3 updated replicas are available...
Waiting for deployment "kube-ovn-controller" rollout to finish: 2 of 3 updated replicas are available...
deployment "kube-ovn-controller" successfully rolled out
```

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6.3.3

## 6.4 OVN

---

### 6.4.1

```
kubectl backup
```

```
# kubectl ko nb backup
tar: Removing leading `/' from member names
backup ovn-nb db to /root/ovnnb_db.060223191654183154.backup

# kubectl ko sb backup
tar: Removing leading `/' from member names
backup ovn-sb db to /root/ovnsb_db.060223191654183154.backup
```

### 6.4.2

```
/var/log/ovn/ovn-northd.log
```

```
* ovn-northd is not running
ovsdb-server: ovsdb error: error reading record 2739 from OVN_Northbound log: record 2739 advances commit index to 6308 but last log index is 6307
* Starting ovsdb-nb
```

|                |                |                |        |
|----------------|----------------|----------------|--------|
| OVN_Northbound | OVN_Southbound | OVN_Northbound | ovn-nb |
|----------------|----------------|----------------|--------|

```
# kubectl ko nb status
9182
Name: OVN_Northbound
Cluster ID: e75f (e75fa340-49ed-45ab-990e-26cb865ebc85)
Server ID: 9182 (9182e8dd-b5b0-4dd8-8518-598cc1e374f3)
Address: tcp:[10.0.128.61]:6643
Status: cluster member
Role: leader
Term: 1454
Leader: self
Vote: self

Last Election started 1732603 ms ago, reason: timeout
Last Election won: 1732587 ms ago
Election timer: 1000
Log: [7332, 12512]
Entries not yet committed: 1
Entries not yet applied: 1
Connections: ->f080 <-f080 <-e631 ->e631
Disconnections: 1
Servers:
  f080 (f080 at tcp:[10.0.129.139]:6643) next_index=12512 match_index=12510 last msg 63 ms ago
  9182 (9182 at tcp:[10.0.128.61]:6643) () next_index=10394 match_index=12510
  e631 (e631 at tcp:[10.0.131.173]:6643) next_index=12512 match_index=0
```

```
kubectl ko nb kick e631
```

```
mv /etc/origin/ovn/ovnnb_db.db /tmp
```

```
ovn-central Pod
```

```
kubectl delete pod -n kube-system ovn-central-xxxx
```

### 6.4.3

leader

#### ovn-central

ovn-central ovn-central

```
kubectl scale deployment -n kube-system ovn-central --replicas=0
```

ovsdb-tool cluster-to-standalone

ovn-central NODE\_IPS

/etc/origin/ovn

```
docker run -it -v /etc/origin/ovn:/etc/ovn kubeovn/kube-ovn:v1.15.0 bash
cd /etc/ovn/
ovsdb-tool cluster-to-standalone ovnnb_db_standalone.db ovnnb_db.db
ovsdb-tool cluster-to-standalone ovnsb_db_standalone.db ovnsb_db.db
```

#### ovn-central

```
mv /etc/origin/ovn/ovnnb_db.db /tmp
mv /etc/origin/ovn/ovnsb_db.db /tmp
```

ovnnb\_db.db ovnsb\_db.db ovn-central NODE\_IPS /etc/origin/ovn/

```
mv /etc/origin/ovn/ovnnb_db_standalone.db /etc/origin/ovn/ovnnb_db.db
mv /etc/origin/ovn/ovnsb_db_standalone.db /etc/origin/ovn/ovnsb_db.db
```

ovn-central

```
kubectl scale deployment -n kube-system ovn-central --replicas=3
kubectl rollout status deployment/ovn-central -n kube-system
```

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### 6.4.4

## 6.5 CIDR

---

CIDR

CIDR Pod

CIDR

Join CIDR

Join CIDR

### 6.5.1

```
kubectl edit cidrBlock gateway excludeIps
```

```
kubectl edit subnet test-subnet
```

### 6.5.2 Namespace Pod

test Namespace

```
for pod in $(kubectl get pod --no-headers -n "$ns" --field-selector spec.restartPolicy=Always -o custom-columns=NAME:.metadata.name,HOST:spec.hostNetwork | awk '{if ($2!="true") print $1}'); do
    kubectl delete pod "$pod" -n test --ignore-not-found
done
```

host Pod

```
for ns in $(kubectl get ns --no-headers -o custom-columns=NAME:.metadata.name); do
    for pod in $(kubectl get pod --no-headers -n "$ns" --field-selector spec.restartPolicy=Always -o custom-columns=NAME:.metadata.name,HOST:spec.hostNetwork | awk '{if ($2!="true") print $1}'); do
        kubectl delete pod "$pod" -n "$ns" --ignore-not-found
    done
done
```

### 6.5.3

CIDR kube-ovn-controller Deployment

```
args:
- --default-cidr=10.17.0.0/16
- --default-gateway=10.17.0.1
- --default-exclude-ipss=10.17.0.1
```

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### 6.5.4

## 6.6 Join CIDR

Join CIDR

Join CIDR Pod

### 6.6.1 Join

```
kubectl patch subnet join --type='json' -p '[{"op": "replace", "path": "/metadata/finalizers", "value": []}]'
kubectl delete subnet join
```

### 6.6.2

```
kubectl annotate node ovn.kubernetes.io/allocated=false --all --overwrite
```

### 6.6.3 Join

`kube-ovn-controller` Join

```
kubectl edit deployment -n kube-system kube-ovn-controller
```

```
args:
- --node-switch-cidr=100.51.0.0/16
```

`kube-ovn-controller` join

```
kubectl delete pod -n kube-system -lapp=kube-ovn-controller
```

Join

```
# kubectl get subnet
NAME      PROVIDER   VPC      PROTOCOL  CIDR      PRIVATE  NAT    DEFAULT  GATEWAYTYPE  V4USED  V4AVAILABLE  V6USED  V6AVAILABLE
EXCLUDEIPS
join      ovn        ovn-cluster  IPv4     100.51.0.0/16  false    false   false   distributed   2       65531        0       0
["100.51.0.1"]
ovn-default  ovn        ovn-cluster  IPv4     10.17.0.0/16   true    true   true   distributed   5       65528        0       0
["10.17.0.1"]
```

### 6.6.4 ovn0

ovn0 kube-ovn-cni

```
kubectl delete pod -n kube-system -l app=kube-ovn-cni
```

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### 6.6.5

## 6.7

kube-ovn.yaml

```
vi kube-ovn.yaml
# ...
- name: kube-ovn-controller
  image: "docker.io/kubeovn/kube-ovn:v1.15.0"
  imagePullPolicy: IfNotPresent
  args:
    - /kube-ovn/start-controller.sh
    - --v=3
# ...
#
```

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### 6.7.1

## 6.8

---

### Kube-OVN

#### 6.8.1

1.

- Pod Pod
- Pod
- Pod Service
- Pod
- Pod
- kube-ovn-pinger

2.

- Pod
- kube-ovn-cni CNI
- ovs-ovn OVS
- kube-ovn-controller
- ovn-central OVN
- dmesg
- netstat -s

3. CPU, IO

```
kubectl ko logs
```

#### 6.8.2 Pod IP

```
Pod     Running    kubectl describe Pod      duplicate IPv4 address <ip> found on logical switch port <port>
```

1. Pod IP Pod IP IP IP IP Pod
2. kube-ovn-controller IP
3. kube-ovn-controller IP
4. kubectl ko nbctl show OVN IP
5. OVN Kubernetes IP kubectl ko nbctl del-port <port>

#### 6.8.3 Pod ping gateway failed

```
Pod     Running    kubectl describe Pod      network <ip> with gateway <gw ip> is not ready for interface eth0 after 30 checks
```

1. kubectl ko sbctl show Pod
2. ovn-central ovs-ovn ovn-central ovs-ovn

3. Pod
4. Underlay [Underlay](#)

#### 6.8.4 Pod

---

VPC Pod

1. kubectl ko trace OVN ACL
2. ACL ACL
3. ACL Subnet stats
4. Subnet Spec
5. kube-ovn-controller

#### 6.8.5 Pod IP CIDR

---

Pod IP CIDR

1. /etc/cni/net.d/ Kube-OVN CNI
- 2.
3. kubelet Pod

#### 6.8.6 Debug Pod

---

kubectl debug Pod ContainerCreating Pod Event network not ready no address allocated

debug Pod yaml yaml Annotation

```
ovn.kubernetes.io/ip_address
ovn.kubernetes.io/mac_address
ovn.kubernetes.io/allocated
ovn.kubernetes.io/routed
```

debug Pod yaml debug Pod

#### 6.8.7 ARM

---

ARM Offload

netstat

```
# netstat -us
IcmpMsg:
  InType0: 22
  InType3: 24
  InType8: 117852
  OutType0: 117852
```

```

OutType3: 29
OutType8: 22
Udp:
  3040636 packets received
  0 packets to unknown port received.
  4 packet receive errors
  602 packets sent
  0 receive buffer errors
  0 send buffer errors
  InCsumErrors: 4
UdpLite:
IpExt:
  InBcastPkts: 10244
  InOctets: 4446320361
  OutOctets: 1496815600
  InBcastOctets: 3095950
  InNoECTPkts: 7683903

```

InCsumErrors

tx offload      TCP

ethtool -K eth0 tx off

CentOS 7

4.19.90-25.16.v2101

## 6.8.8 Pod Service

Pod      Service      dmesg

```

netlink: Unknown conntrack attr (type=6, max=5)
openvswitch: netlink: Flow actions may not be safe on all matching packets.

```

OVS      NAT

1.      OVS

2.      Overlay      kube-ovn-controller      --enable-lb=false      OVN LB      kube-proxy      Service

## 6.8.9 ovn-central

v1.11.x      1      Pod      OVN NB      SB      Kube-OVN      ovsdb-server/compact

ovn-central      compact

```

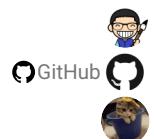
- name: ENABLE_COMPACT
  value: "false"

```

[PDF](#)[Slack](#)[Support](#)

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6.8.10

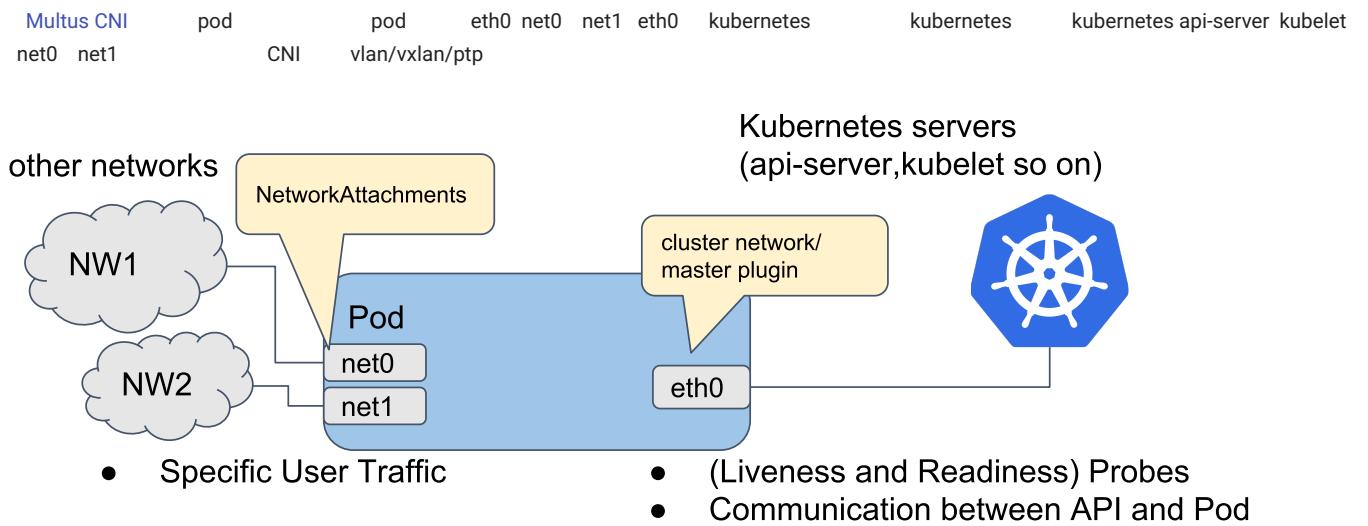
---

## 7.

## 7.1

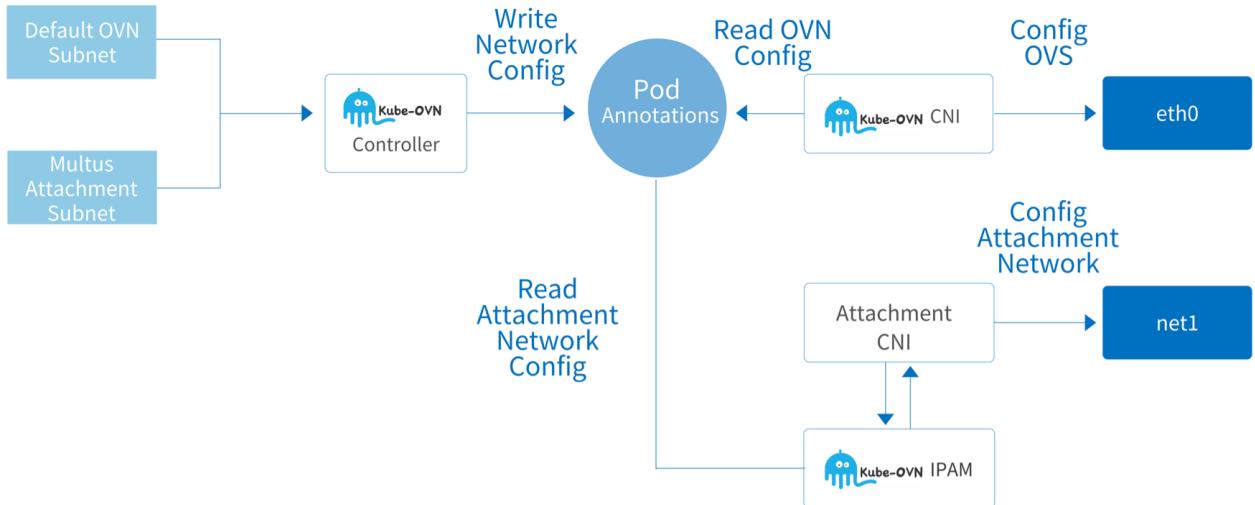
|          |     |                                |      |          |    |
|----------|-----|--------------------------------|------|----------|----|
| Kube-OVN | CNI | macvlan<br>vlan<br>host-device | IPAM | Kube-OVN | IP |
| Kube-OVN |     | Kube-OVN                       |      |          |    |

## 7.1.1



## IPAM

|            |     |    |          |        |    |     |    |    |
|------------|-----|----|----------|--------|----|-----|----|----|
| Multus CNI | Pod | IP | Kube-OVN | Subnet | IP | CRD | IP | IP |
|            |     |    | IPAM     |        |    |     |    |    |



|     | Kube-OVN            | IP   | eth0         | OVN        | net1           | CNI | net1 | multus-cni | NetworkAttachmentDefinition |
|-----|---------------------|------|--------------|------------|----------------|-----|------|------------|-----------------------------|
| Pod | kube-ovn-controller | Pod  | Pod          | annotation | Subnet         | IP  | Pod  | Pod        | Pod annotation              |
| CNI | kube-ovn-cni        | ipam | kube-ovn-cni |            | Pod annotation | CNI |      | CNI        | CNI                         |

## 7.1.2

NetworkAttachmentDefinition spec multus defaultConfDir CNI

```
apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: macvlan-conf-2
```

|                     |                                      |      |           |
|---------------------|--------------------------------------|------|-----------|
| kube-ovn-controller | NetworkAttachmentDefinition provider | spec | kube-ovn- |
| controller          | provider                             | spec | IPAM      |

## 7.1.3

### Kube-OVN Multus

[Kube-OVN](#)    [Multus how to use](#)    [Kube-OVN Multus-CNI](#)

### CNI IPAM

Kube-OVN                          CNI

NETWORKATTACHMENTDEFINITION

macvlan                              ipam                              kube-ovn

```
#   macvlan
sudo modprobe macvlan
```

```

apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: macvlan
  namespace: default
spec:
  config: '{
    "cniVersion": "0.3.0",
    "type": "macvlan",
    "master": "eth0",
    "mode": "bridge",
    "ipam": {
      "type": "kube-ovn",
      "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
      "provider": "macvlan.default"
    }
}'

```

- spec.config.ipam.type: kube-ovn kube-ovn
- server\_socket: Kube-OVN socket /run/openvswitch/kube-ovn-daemon.sock
- provider: NetworkAttachmentDefinition <name>. <namespace> Kube-OVN Subnet
- master:

**i Info**

|                                   |
|-----------------------------------|
| provider Underlay ProviderNetwork |
|-----------------------------------|

## KUBE-OVN SUBNET

|                 |           |             |          |   |         |
|-----------------|-----------|-------------|----------|---|---------|
| Kube-OVN Subnet | cidrBlock | exclude_ips | provider | NetworkAttachmentDefinition <name>. <namespace> | macvlan |
| Subnet          |           |             |          |   |         |

```

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: macvlan
spec:
  protocol: IPv4
  provider: macvlan.default
  cidrBlock: 172.17.0.0/16
  gateway: 172.17.0.1
  excludeIps:
  - 172.17.0.0..172.17.0.10

```

|         |         |     |          |     |                    |
|---------|---------|-----|----------|-----|--------------------|
| gateway | private | nat | provider | ovn | attachment network |
|---------|---------|-----|----------|-----|--------------------|

## Pod

|     |  |  |
|-----|--|--|
| Pod | annotation k8s.v1.cni.cncf.io/networks | NetworkAttachmentDefinition <namespace>/<name> |
|-----|--|--|

```

apiVersion: v1
kind: Pod
metadata:
  name: samplepod
  namespace: default
  annotations:
    k8s.v1.cni.cncf.io/networks: default/macvlan
spec:
  containers:
  - name: samplepod
    command: ["/bin/bash", "-c", "trap : TERM INT; sleep infinity & wait"]
    image: docker.io/library/alpine:edge

```

## IP Pod

|   |
|---|
| IP Pod <networkAttachmentName>. <networkAttachmentNamespace>. kubernetes.io/ip_address annotation |
|---|

```

apiVersion: v1
kind: Pod
metadata:
  name: static-ip
  namespace: default
  annotations:
    k8s.v1.cni.cncf.io/networks: default/macvlan
    ovn.kubernetes.io/ip_address: 10.16.0.15
    ovn.kubernetes.io/mac_address: 00:00:00:53:6B:B6

```

```

macvlan.default.kubernetes.io/ip_address: 172.17.0.100
macvlan.default.kubernetes.io/mac_address: 00:00:00:53:6B:BB
spec:
  containers:
  - name: static-ip
    image: docker.io/library/nginx:alpine

```

IP

ippool <networkAttachmentName>.<networkAttachmentNamespace>.kubernetes.io/ip\_pool annotation

```

apiVersion: apps/v1
kind: Deployment
metadata:
  namespace: default
  name: static-workload
  labels:
    app: static-workload
spec:
  replicas: 2
  selector:
    matchLabels:
      app: static-workload
  template:
    metadata:
      labels:
        app: static-workload
      annotations:
        k8s.v1.cni.cncf.io/networks: default/macvlan
        ovn.kubernetes.io/ip_pool: 10.16.0.15,10.16.0.16,10.16.0.17
        macvlan.default.kubernetes.io/ip_pool: 172.17.0.200,172.17.0.201,172.17.0.202
  spec:
    containers:
    - name: static-workload
      image: docker.io/library/nginx:alpine

```

macvlan Pod

| macvlan | Pod | Pod | annotation | default-route |
|---------|-----|-----|------------|---------------|
|---------|-----|-----|------------|---------------|

```

apiVersion: v1
kind: Pod
metadata:
  name: samplepod-route
  namespace: default
  annotations:
    k8s.v1.cni.cncf.io/networks: '[{
      "name": "macvlan",
      "namespace": "default",
      "default-route": ["172.17.0.1"]
    }]'
spec:
  containers:
  - name: samplepod-route
    command: ["/bin/ash", "-c", "trap : TERM INT; sleep infinity & wait"]
    image: docker.io/library/alpine:edge

```

macvlan Pod

| macvlan | Pod | annotation v1.multus-cni.io/default-network | NetworkAttachmentDefinition <namespace>/<name> |
|---------|-----|---|--|
|---------|-----|---|--|

```

apiVersion: v1
kind: Pod
metadata:
  name: samplepod-macvlan
  namespace: default
  annotations:
    v1.multus-cni.io/default-network: default/macvlan
spec:
  containers:
  - name: samplepod-macvlan
    command: ["/bin/ash", "-c", "trap : TERM INT; sleep infinity & wait"]
    image: docker.io/library/alpine:edge

```

**KUBE-OVN SUBNET PROVIDER OVN**

| provider | ovn | subnet | IP | provider | ovn | Kube-OVN Subnet | cidrBlock | exclude_ips | Subnet |
|----------|-----|--------|----|----------|-----|-----------------|-----------|-------------|--------|
|----------|-----|--------|----|----------|-----|-----------------|-----------|-------------|--------|

```

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: macvlan
spec:
  protocol: IPv4
  provider: ovn

```

```
cidrBlock: 172.17.0.0/16
gateway: 172.17.0.1
excludeIps:
- 172.17.0.0..172.17.0.10
```

**Pod**

|                 |            |               |           |            |                   |   |
|-----------------|------------|---------------|-----------|------------|-------------------|---|
| <b>provider</b> | <b>ovn</b> | <b>subnet</b> | <b>IP</b> | <b>Pod</b> | <b>annotation</b> | k8s.v1.cni.cncf.io/networks <networkAttachmentName>.<networkAttachmentNamespace>.kubernetes.io/logical_switch |
|-----------------|------------|---------------|-----------|------------|-------------------|---|

```
apiVersion: v1
kind: Pod
metadata:
  name: samplepod
  namespace: default
  annotations:
    k8s.v1.cni.cncf.io/networks: default/macvlan
    macvlan.default.kubernetes.io/logical_switch: macvlan
spec:
  containers:
  - name: samplepod
    command: ["/bin/ash", "-c", "trap : TERM INT; sleep infinity & wait"]
    image: docker.io/library/alpine:edge
```

- k8s.v1.cni.cncf.io/networks : NetworkAttachmentDefinition <namespace>/<name>

- macvlan.default.kubernetes.io/logical\_switch :

|   |   |
|---|---|
| • <networkAttachmentName>.<networkAttachmentNamespace>.kubernetes.io/logical_switch | provider  |
| • ovn   | subnet      ipam      IP      Pod      IP      macvlan      Pod |
| •   | macvlan      Pod  |

**Kube-OVN****Kube-OVN****NETWORKATTACHMENTDEFINITION**

```
provider ovn

apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: attachnet
  namespace: default
spec:
  config: '{
    "cniVersion": "0.3.0",
    "type": "kube-ovn",
    "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
    "provider": "attachnet.default.ovn"
  }'
```

- spec.config.type : kube-ovn CNI Kube-OVN
- server\_socket : Kube-OVN socket /run/openvswitch/kube-ovn-daemon.sock
- provider : NetworkAttachmentDefinition <name>.<namespace>.ovn Kube-OVN Subnet ovn

**KUBE-OVN SUBNET**

|          |          |                             |                        |     |          |        |
|----------|----------|-----------------------------|------------------------|-----|----------|--------|
| Kube-OVN | provider | NetworkAttachmentDefinition | <name>.<namespace>.ovn | ovn | Kube-OVN | Subnet |
|----------|----------|-----------------------------|------------------------|-----|----------|--------|

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: attachnet
spec:
  protocol: IPv4
  provider: attachnet.default.ovn
  cidrBlock: 172.17.0.0/16
  gateway: 172.17.0.1
  excludeIps:
  - 172.17.0.0..172.17.0.10
```

**Pod**

| Pod | annotation k8s.v1.cni.cncf.io/networks | NetworkAttachmentDefinition <namespace>/<name> |
|-----|--|--|
|-----|--|--|

```
apiVersion: v1
kind: Pod
metadata:
  name: samplepod
  namespace: default
  annotations:
    k8s.v1.cni.cncf.io/networks: default/attachnet
spec:
  containers:
  - name: samplepod
    command: ["/bin/ash", "-c", "trap : TERM INT; sleep infinity & wait"]
    image: docker.io/library/alpine:edge
```

| Kube-OVN | Pod | <networkAttachmentName>.<networkAttachmentNamespace>.ovn.kubernetes.io/routes annotation |
|----------|-----|--|
|----------|-----|--|

```
apiVersion: v1
kind: Pod
metadata:
  name: custom-routes-attach
  namespace: default
  annotations:
    k8s.v1.cni.cncf.io/networks: default/attachnet
    attachnet.default.ovn.kubernetes.io/routes: |
      [
        {
          "dst": "192.168.0.101/24",
          "gw": "172.17.0.254"
        },
        {
          "gw": "172.17.0.254"
        }
      ]
spec:
  containers:
  - name: custom-routes-attach
    command: ["/bin/ash", "-c", "trap : TERM INT; sleep infinity & wait"]
    image: docker.io/library/alpine:edge
```

dst

| Deployment | DaemonSet | StatefulSet | Annotation | .spec.template.metadata.annotations |
|------------|-----------|-------------|------------|-------------------------------------|
|------------|-----------|-------------|------------|-------------------------------------|

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: custom-routes-attach
  labels:
    app: nginx
spec:
  replicas: 2
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
      annotations:
        k8s.v1.cni.cncf.io/networks: default/attachnet
        attachnet.default.ovn.kubernetes.io/routes: |
          [
            {
              "dst": "192.168.0.101/24",
              "gw": "172.17.0.254"
            },
            {
              "gw": "172.17.0.254"
            }
          ]
  spec:
    containers:
    - name: nginx
      image: docker.io/library/nginx:alpine
```

**KUBE-OVN SUBNET PROVIDER OVN**

| provider | ovn | subnet | IP | provider | ovn | Kube-OVN Subnet | cidrBlock | exclude_ips | Subnet |
|----------|-----|--------|----|----------|-----|-----------------|-----------|-------------|--------|
|----------|-----|--------|----|----------|-----|-----------------|-----------|-------------|--------|

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: attachnet
spec:
  protocol: IPv4
  provider: ovn
  cidrBlock: 172.17.0.0/16
```

```
gateway: 172.17.0.1
excludeIps:
- 172.17.0.0..172.17.0.10
```

#### Pod

```
provider      ovn subnet    IP Pod     annotation k8s.v1.cni.cncf.io/networks
<networkAttachmentName>.<networkAttachmentNamespace>.ovn.kubernetes.io/logical_switch
```

```
apiVersion: v1
kind: Pod
metadata:
  name: samplepod
  namespace: default
  annotations:
    k8s.v1.cni.cncf.io/networks: default/attachnet
    attachnet.default.ovn.kubernetes.io/logical_switch: attachnet
spec:
  containers:
  - name: samplepod
    command: ["/bin/ash", "-c", "trap : TERM INT; sleep infinity & wait"]
    image: docker.io/library/alpine:edge
```

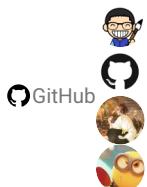
- k8s.v1.cni.cncf.io/networks : NetworkAttachmentDefinition <namespace>/<name>
- attachnet.default.ovn.kubernetes.io/logical\_switch :

- <networkAttachmentName>.<networkAttachmentNamespace>.ovn.kubernetes.io/logical\_switch provider
- Kube-OVN Pod IP Pod IP macvlan Pod Kube-OVN Pod
- Kube-OVN Pod <networkAttachmentName>.<networkAttachmentNamespace>.ovn.kubernetes.io/routes annotation

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7.1.4

## 7.2

---

Kube-OVN

Kube-OVN

### 7.2.1

---

|    |         |        |
|----|---------|--------|
| 1. | CNI     | CNI    |
| 2. | 10ns    | 20ns   |
| 3. | CPU     | CPU    |
| 4. | Macvlan | SR-IOV |

### 7.2.2

---

#### Overlay

- Kubernetes: 1.22.0
- OS: CentOS 7
- Kube-OVN: 1.8.0 *Overlay*
- CPU: Intel(R) Xeon(R) E-2278G
- Network: 2\*10Gbps, xmit\_hash\_policy=layer3+4

```
qperf -t 60 <server ip> -ub -oo msg_size:1 -vu tcp_lat tcp_bw udp_lat udp_bw 1      tcp/udp
```

| Type               | tcp_lat (us) | udp_lat (us) | tcp_bw (Mb/s) | udp_bw(Mb/s) |
|--------------------|--------------|--------------|---------------|--------------|
| Kube-OVN Default   | 25.7         | 22.9         | 27.1          | 1.59         |
| Kube-OVN Optimized | 13.9         | 12.9         | 27.6          | 5.57         |
| HOST Network       | 13.1         | 12.4         | 28.2          | 6.02         |

#### Overlay Underlay

Kube-OVN      Overlay    Underlay

*Environment:*

- Kubernetes: 1.22.0
- OS: CentOS 7
- Kube-OVN: 1.8.0
- CPU: AMD EPYC 7402P 24-Core Processor
- Network: Intel Corporation Ethernet Controller XXV710 for 25GbE SFP28

```
qperf -t 60 <server ip> -ub -oo msg_size:1 -vu tcp_lat tcp_bw udp_lat udp_bw
```

| Type              | tcp_lat (us) | udp_lat (us) | tcp_bw (Mb/s) | udp_bw(Mb/s) |
|-------------------|--------------|--------------|---------------|--------------|
| Kube-OVN Overlay  | 15.2         | 14.6         | 23.6          | 2.65         |
| Kube-OVN Underlay | 14.3         | 13.8         | 24.2          | 3.46         |
| HOST Network      | 16.6         | 15.4         | 24.8          | 2.64         |

```
qperf -t 60 <server ip> -ub -oo msg_size:1K -vu tcp_lat tcp_bw udp_lat udp_bw
```

| Type              | tcp_lat (us) | udp_lat (us) | tcp_bw (Gb/s) | udp_bw(Gb/s) |
|-------------------|--------------|--------------|---------------|--------------|
| Kube-OVN Overlay  | 16.5         | 15.8         | 10.2          | 2.77         |
| Kube-OVN Underlay | 15.9         | 14.5         | 9.6           | 3.22         |
| HOST Network      | 18.1         | 16.6         | 9.32          | 2.66         |

```
qperf -t 60 <server ip> -ub -oo msg_size:4K -vu tcp_lat tcp_bw udp_lat udp_bw
```

| Type              | tcp_lat (us) | udp_lat (us) | tcp_bw (Gb/s) | udp_bw(Gb/s) |
|-------------------|--------------|--------------|---------------|--------------|
| Kube-OVN Overlay  | 34.7         | 41.6         | 16.0          | 9.23         |
| Kube-OVN Underlay | 32.6         | 44           | 15.1          | 6.71         |
| HOST Network      | 35.9         | 45.9         | 14.6          | 5.59         |

netfilter      kube-proxy      netfilter

## 7.2.3

### CPU

CPU

CPU

```
cpupower frequency-set -g performance
```

```
# ethtool -g eno1
Ring parameters for eno1:
Pre-set maximums:
RX:        4096
RX Mini:   0
RX Jumbo:  0
TX:        4096
Current hardware settings:
RX:        255
RX Mini:   0
RX Jumbo:  0
TX:        255
```

```
ethtool -G eno1 rx 4096
ethtool -G eno1 tx 4096
```

**tuned**

tuned profile

tuned-adm profile network-latency

tuned-adm profile network-throughput

irqbalance CPU CPU

**OVN LB**

|            |                     |             |     |     |     |         |            |         |
|------------|---------------------|-------------|-----|-----|-----|---------|------------|---------|
| OVN L2 LB  | conntrack           | recirculate | CPU | 20% | CPU | Overlay | kube-proxy | Service |
| Pod-to-Pod | kube-ovn-controller |             |     |     |     |         |            |         |

```
command:
- /kube-ovn/start-controller.sh
args:
...
- --enable-lb=false
...
```

|          |            |          |      |    |         |
|----------|------------|----------|------|----|---------|
| Underlay | kube-proxy | iptables | ipvs | LB | Service |
|----------|------------|----------|------|----|---------|

**conntrack**

|                     |                            |         |               |          |     |          |         |
|---------------------|----------------------------|---------|---------------|----------|-----|----------|---------|
| OVN LB              | Service                    | Service | NetworkPolicy | Subnet A | Pod | Subnet B | Service |
| kube-ovn-controller | --skip-conntrack-dst-cidrs |         | conntrack     |          |     |          |         |

```
--skip-conntrack-dst-cidrs="10.17.0.0/16,169.254.169.245/32"
```

**FastPath**

|            |           |         |           |          |           |     |
|------------|-----------|---------|-----------|----------|-----------|-----|
| network ns | netfilter | 20% CPU | netfilter | FastPath | netfilter | CPU |
|------------|-----------|---------|-----------|----------|-----------|-----|

|           |          |      |          |
|-----------|----------|------|----------|
| netfilter | iptables | ipvs | nftables |
|-----------|----------|------|----------|

**FastPath**

|                             |          |       |
|-----------------------------|----------|-------|
| insmod kube_ovn_fastpath.ko | FastPath | dmesg |
|-----------------------------|----------|-------|

```
# dmesg
...
[619631.323788] init_module,kube_ovn_fastpath_local_out
[619631.323798] init_module,kube_ovn_fastpath_post_routing
[619631.323800] init_module,kube_ovn_fastpath_pre_routing
[619631.323801] init_module,kube_ovn_fastpath_local_in
...
```

**OVS**

|          |         |         |               |      |     |
|----------|---------|---------|---------------|------|-----|
| OVS flow | 10% CPU | x86 CPU | popcnt sse4.2 | flow | CPU |
| 5%       |         |         |               |      |     |

**FastPath**

## CPU

```
cat /proc/cpuinfo | grep popcnt
cat /proc/cpuinfo | grep sse4_2
```

## CENTOS

```
yum install -y gcc kernel-devel-$(uname -r) python3 autoconf automake libtool rpm-build openssl-devel
```

OVS      RPM :

```
git clone -b branch-3.5 --depth=1 https://github.com/openvswitch/ovs.git
cd ovs
curl -s https://github.com/kubeovn/ovs/commit/2d2c83c26d4217446918f39d5cd5838e9ac27b32.patch | git apply
./boot.sh
./configure --with-linux=/lib/modules/$(uname -r)/build CFLAGS="-g -O2 -mpopcnt -msse4.2"
make rpm-fedora-kmod
cd rpm/rpmbuild/RPMS/x86_64/
```

## RPM

```
rpm -i openvswitch-kmod-3.5.1-1.el7.x86_64.rpm
```

Kube-OVN    OVS

## UBUNTU

```
apt install -y autoconf automake libtool gcc build-essential libssl-dev
```

## OVS

```
apt install -y autoconf automake libtool gcc build-essential libssl-dev

git clone -b branch-3.5 --depth=1 https://github.com/openvswitch/ovs.git
cd ovs
curl -s https://github.com/kubeovn/ovs/commit/2d2c83c26d4217446918f39d5cd5838e9ac27b32.patch | git apply
./boot.sh
./configure --prefix=/usr/ --localstatedir=/var --enable-ssl --with-linux=/lib/modules/$(uname -r)/build
make -j `nproc`
make install
make modules_install

cat > /etc/modprobe.d/openvswitch.conf << EOF
override openvswitch * extra
override vport-* * extra
EOF

depmod -a
cp debian/openvswitch-switch.init /etc/init.d/openvswitch-switch
/etc/init.d/openvswitch-switch force-reload-kmod
```

Kube-OVN    OVS

## STT

 Warning

OpenVswitch 3.6 STT Tunnel

|     |        |       |     |     |     |     |         |     |
|-----|--------|-------|-----|-----|-----|-----|---------|-----|
|     | Geneve | Vxlan | UDP | UDP | TCP | TCP | offload | TCP |
| CPU |        | TCP   |     |     |     |     |         |     |
| STT |        | TCP   |     | TCP |     | TCP |         | TCP |
| STT |        | OVS   |     | OVS |     |     |         |     |

## STT

```
kubectl set env daemonset/ovs-ovn -n kube-system TUNNEL_TYPE=stt  
kubectl delete pod -n kube-system -lapp=ovs
```

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---

**7.2.4**

## 7.3 FastPath

Profile Netfilter

20% CPU FastPath

Netfilter CPU

FastPath

### 7.3.1

```
git clone --depth=1 https://github.com/kubeovn/kube-ovn.git
```

### 7.3.2

CentOS

```
yum install -y kernel-devel-$(uname -r) gcc elfutils-libelf-devel
```

### 7.3.3

3.x

```
cd kube-ovn/fastpath
make all
```

4.x

```
cd kube-ovn/fastpath/4.18
cp ../Makefile .
make all
```

### 7.3.4

```
kube_ovn_fastpath.ko          /tmp      kube-ovn-cni
```

dmesg

```
# dmesg
[619631.323788] init_module,kube_ovn_fastpath_local_out
[619631.323798] init_module,kube_ovn_fastpath_post_routing
[619631.323800] init_module,kube_ovn_fastpath_pre_routing
[619631.323801] init_module,kube_ovn_fastpath_local_in
```

/tmp kube-ovn-cni



PDF



Slack



Support

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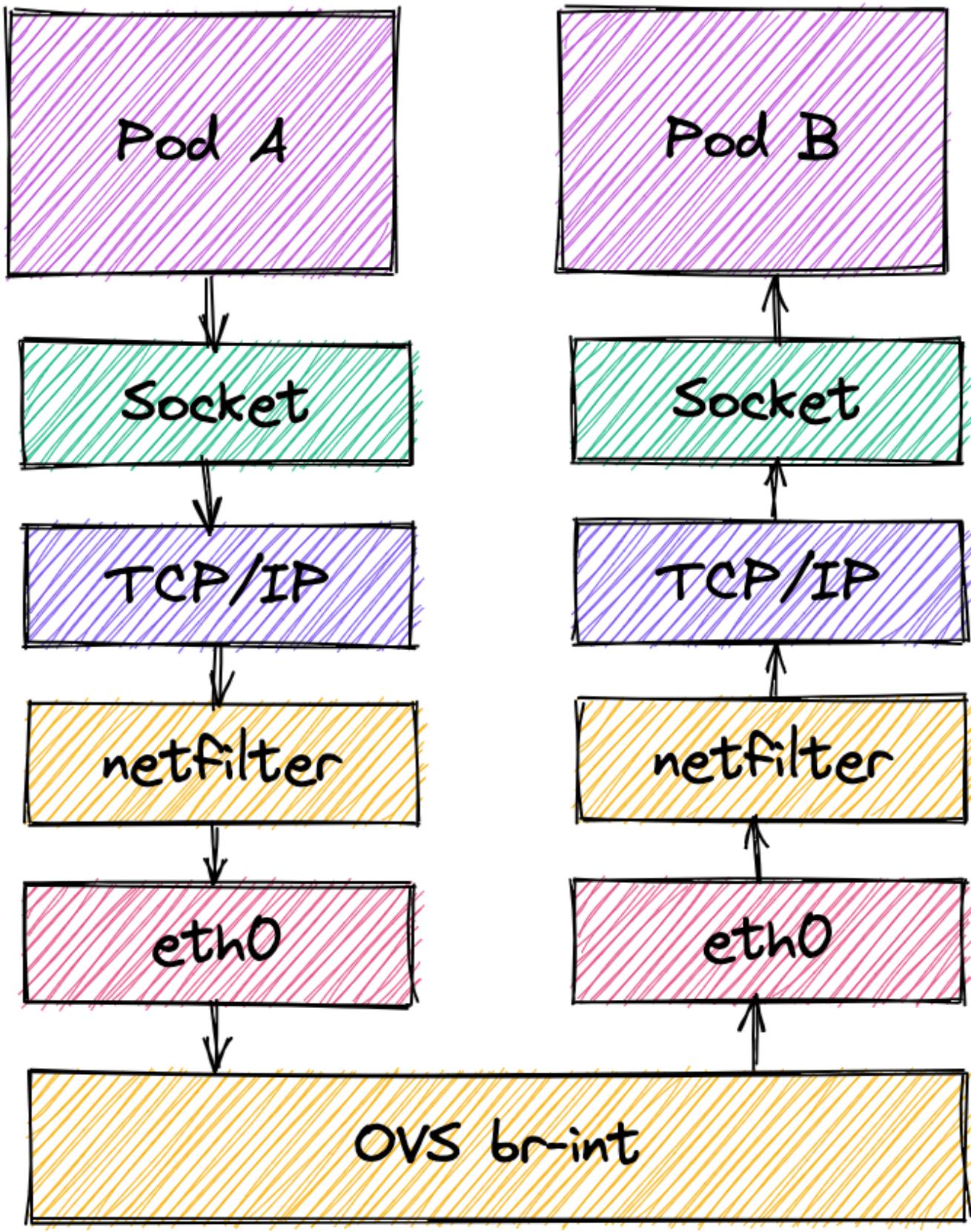
### 7.3.5

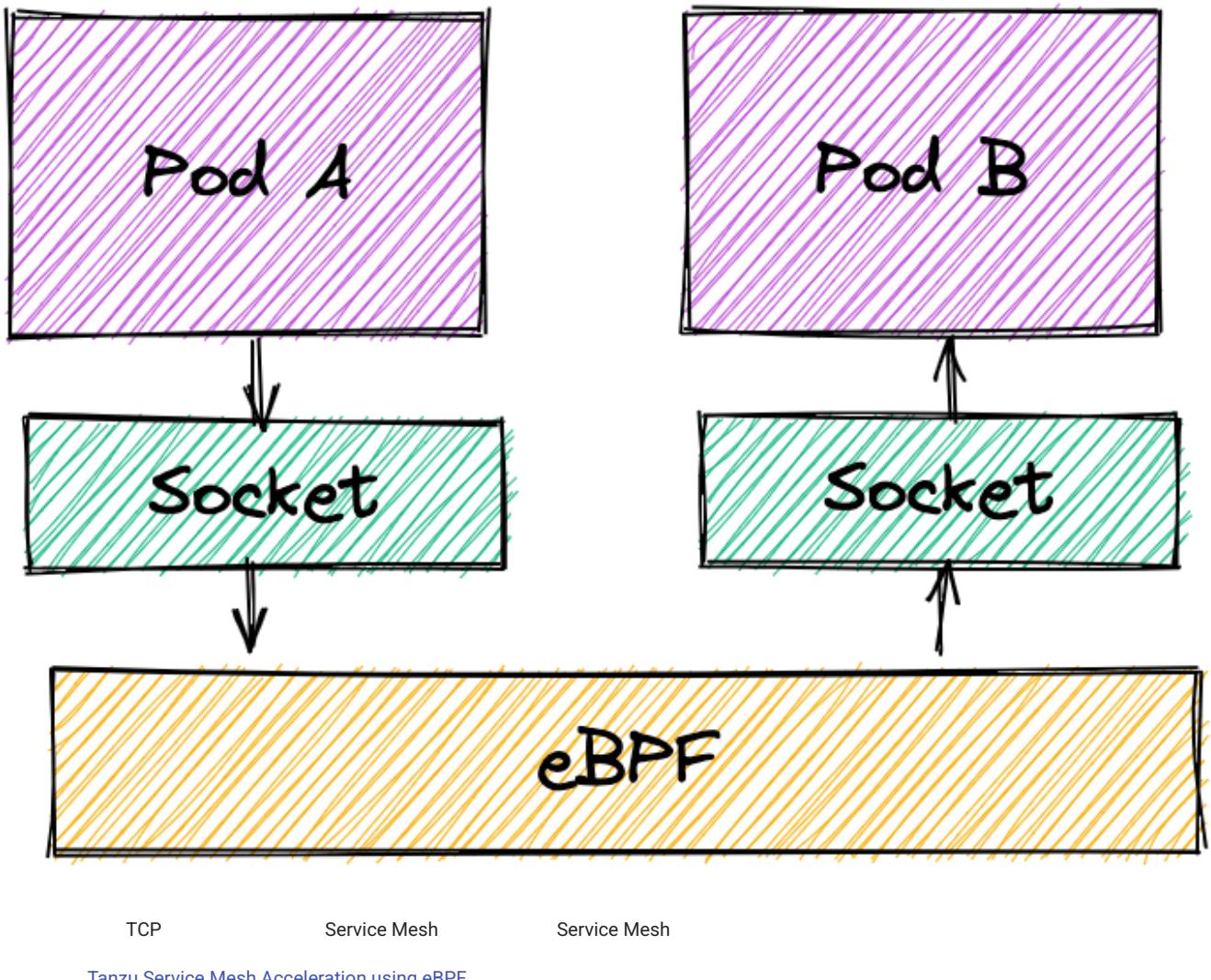
## 7.4 eBPF TCP

5G Pod TCP Intel **istio-tcpip-bypass** Pod eBPF TCP/IP socket

### 7.4.1

Pod TCP TCP/IP, netfilter, OVS





## 7.4.2

eBPF      Ubuntu 20.04    Linux 5.4.0-74-generic

## 7.4.3

Pod                  nodeSelector

```
# kubectl create deployment perf --image=kubeovn/perf:dev --replicas=2
deployment.apps/perf created
# kubectl get pod -o wide
NAME           READY   STATUS    RESTARTS   AGE     IP          NODE   NOMINATED NODE   READINESS GATES
perf-7697bc6ddf-b2cpv  1/1    Running   0          28s    100.64.0.3  sealos <none>        <none>
perf-7697bc6ddf-p2xpt  1/1    Running   0          28s    100.64.0.2  sealos <none>        <none>
```

Pod qperf server    Pod qperf client

```
# kubectl exec -it perf-7697bc6ddf-b2cpv sh
/ # qperf

# kubectl exec -it perf-7697bc6ddf-p2xpt sh
/ # qperf -t 60 100.64.0.3 -ub -oo msg_size:1:16K:*4 -vu tcp_lat tcp_bw
```

istio-tcpip-bypass

```
kubectl apply -f https://raw.githubusercontent.com/intel/istio-tcpip-bypass/main/bypass-tcpip-daemonset.yaml
```

### perf client

```
# kubectl exec -it perf-7697bc6ddf-p2xpt sh
/ # qperf -t 60 100.64.0.3 -ub -oo msg_size:1:16K:*4 -vu tcp_lat tcp_bw
```

#### 7.4.4

TCP            40% ~ 60%            1024            40% ~ 80%

| Packet Size (byte) | eBPF tcp_lat (us) | Default tcp_lat (us) | eBPF tcp_bw (Mb/s) | Default tcp_bw(Mb/s) |
|--------------------|-------------------|----------------------|--------------------|----------------------|
| 1                  | 20.2              | 44.5                 | 1.36               | 4.27                 |
| 4                  | 20.2              | 48.7                 | 5.48               | 16.7                 |
| 16                 | 19.6              | 41.6                 | 21.7               | 63.5                 |
| 64                 | 18.8              | 41.3                 | 96.8               | 201                  |
| 256                | 19.2              | 36                   | 395                | 539                  |
| 1024               | 18.3              | 42.4                 | 1360               | 846                  |
| 4096               | 16.5              | 62.6                 | 4460               | 2430                 |
| 16384              | 20.2              | 58.8                 | 9600               | 6900                 |

512            eBPF            TCP            eBPF            eBPF TCP

#### 7.4.5

1. [istio-tcpip-bypass](#)
2. [Deep Dive TCP/IP Bypass with eBPF in Service Mesh](#)
3. [Tanzu Service Mesh Acceleration using eBPF](#)

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[!\[\]\(24eabc3bbeb6780f1e790054f1ec8c7a\_img.jpg\) Slack](#)

[!\[\]\(12eb4ed7ee2c18153b551ae078b306e9\_img.jpg\) Support](#)

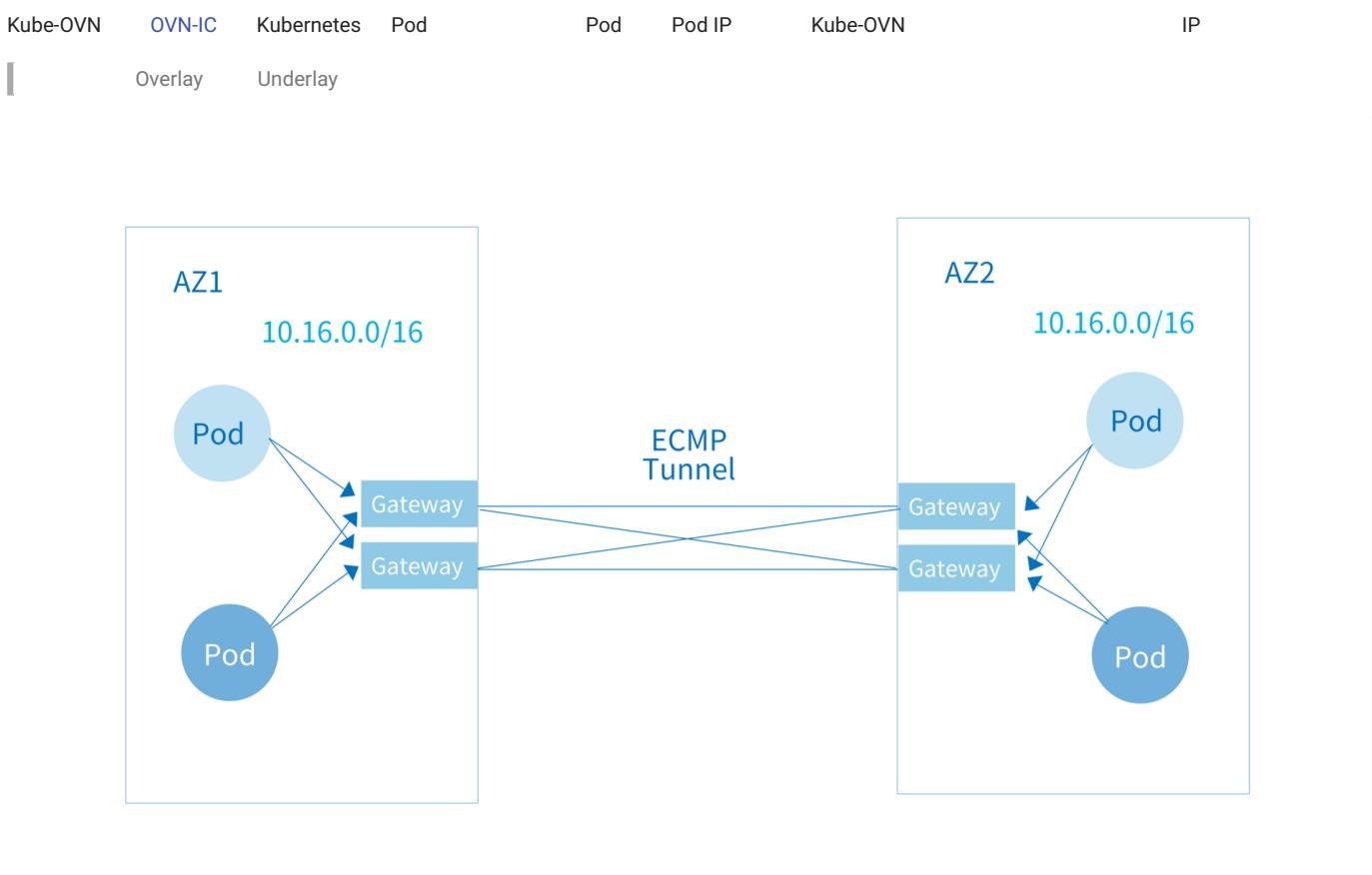
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#### 7.4.6

## 7.5 OVN-IC



## Limitation

| OVN-IC | Pod IP | Service | DNS | NetworkPolicy | Istio |
|--------|--------|---------|-----|---------------|-------|
|--------|--------|---------|-----|---------------|-------|

### 7.5.1

1. 1.11.16 install.sh

ENABLE\_TC=true

## deployment ovn-ic-controller

2 CIDR

3. kube-ovn-controller IP

4. IP

## 5. VPC VPC

## 7.5.2 OVN-IC

1

1 Kube-OVN v1.11.16

" " " " Deployment master master 1 master

```
install-ovn-ic.sh
```

```
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/release-1.15/dist/images/install-ic-server.sh
```

| TS_NUM | ECMP Path |
|--------|-----------|
|--------|-----------|

```
sed 's/VERSION=.*/VERSION=v1.15.0/' dist/images/install-ic-server.sh | TS_NUM=3 bash
```

```
deployment.apps/ovn-ic-server created
Waiting for deployment spec update to be observed...
Waiting for deployment "ovn-ic-server" rollout to finish: 0 out of 3 new replicas have been updated...
Waiting for deployment "ovn-ic-server" rollout to finish: 0 of 3 updated replicas are available...
Waiting for deployment "ovn-ic-server" rollout to finish: 1 of 3 updated replicas are available...
Waiting for deployment "ovn-ic-server" rollout to finish: 2 of 3 updated replicas are available...
Waiting for deployment "ovn-ic-server" rollout to finish: 3 of 3 updated replicas are available...
deployment "ovn-ic-server" successfully rolled out
OVN IC Server installed Successfully
```

```
kubectl ko icsbctl show
```

```
kubectl ko icsbctl show
availability-zone az0
  gateway 059b5c54-c540-4d77-b009-02d65f181a0
    hostname: kube-ovn-worker
    type: geneve
      ip: 172.18.0.3
    port ts-az0
      transit switch: ts
      address: ["00:00:00:B4:8E:BE 169.254.100.97/24"]
  gateway 74ee4b9a-ba48-4a07-861e-1a8e4b9f905f
    hostname: kube-ovn-worker2
    type: geneve
      ip: 172.18.0.2
    port ts1-az0
      transit switch: ts1
      address: ["00:00:00:19:2E:F7 169.254.101.90/24"]
  gateway 7e2428b6-344c-4dd5-a0d5-972c1cc581
    hostname: kube-ovn-control-plane
    type: geneve
      ip: 172.18.0.4
    port ts2-az0
      transit switch: ts2
      address: ["00:00:00:EA:32:BA 169.254.102.103/24"]
availability-zone az1
  gateway 034da7cb-3826-4318-81ce-6a877a9bf285
    hostname: kube-ovn1-worker
    type: geneve
      ip: 172.18.0.6
    port ts-az1
      transit switch: ts
      address: ["00:00:00:25:3A:B9 169.254.100.51/24"]
  gateway 2531a683-283e-4fb8-a619-bdbcb33539b8
    hostname: kube-ovn1-worker2
    type: geneve
      ip: 172.18.0.5
    port ts1-az1
      transit switch: ts1
      address: ["00:00:00:52:87:F4 169.254.101.118/24"]
  gateway b0efb0be-e5a7-4323-ad4b-317637a757c4
    hostname: kube-ovn1-control-plane
    type: geneve
      ip: 172.18.0.8
    port ts2-az1
      transit switch: ts2
      address: ["00:00:00:F6:93:1A 169.254.102.17/24"]
```

## 2

| kube-ovn-controller | IP | OVN-IC |
|---------------------|----|--------|
|---------------------|----|--------|

|        |  |        |
|--------|--|--------|
| docker |  | OVN-IC |
|--------|--|--------|

```
docker run --name=ovn-ic-db -d --env "ENABLE_OVN_LEADER_CHECK=false" --network=host --privileged -v /etc/ovn/:/etc/ovn -v /var/run/ovn:/var/run/ovn -v /var/log/ovn:/var/log/ovn kubeovn/kube-ovn:v1.15.0 bash start-ic-db.sh
```

|            |        |
|------------|--------|
| containerd | docker |
|------------|--------|

```
ctr -n k8s.io run -d --env "ENABLE_OVN_LEADER_CHECK=false" --net-host --privileged --mount="type=bind,src=/etc/ovn/,dst=/etc/ovn,options=rbind:rw" --mount="type=bind,src=/var/run/ovn,dst=/var/run/ovn,options=rbind:rw" --mount="type=bind,src=/var/log/ovn,dst=/var/log/ovn,options=rbind:rw" docker.io/kubeovn/kube-ovn:v1.15.0 ovn-ic-db bash start-ic-db.sh
```

## 7.5.3

| VPC | Subnet | CIDR | OVN-IC | Subnet CIDR |
|-----|--------|------|--------|-------------|
|-----|--------|------|--------|-------------|

kube-system Namespace    ovn-ic-config ConfigMap

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: ovn-ic-config
  namespace: kube-system
data:
  enable-ic: "true"
  az-name: "az1"
  ic-db-host: "192.168.65.3"
  ic-nb-port: "6645"
  ic-sb-port: "6646"
  gw-nodes: "az1-gw"
  auto-route: "true"
```

- enable-ic:
- az-name:
- ic-db-host: OVN-IC
- ic-nb-port: OVN-IC              6645
- ic-sb-port: OVN-IC              6646
- gw-nodes:
- auto-route:

| ovn-ic-config | ConfigMap | ConfigMap | ConfigMap |
|---------------|-----------|-----------|-----------|
|---------------|-----------|-----------|-----------|

ovn-ic              ts

```
# ovn-ic-sbctl show
availability-zone az1
  gateway deee03e0-af16-4f45-91e9-b50c3960f809
    hostname: az1-gw
    type: geneve
      ip: 192.168.42.145
    port ts-az1
      transit switch: ts
      address: ["00:00:00:50:AC:8C 169.254.100.45/24"]
availability-zone az2
  gateway e94cc831-8143-40e3-a478-90352773327b
    hostname: az2-gw
    type: geneve
      ip: 192.168.42.149
    port ts-az2
      transit switch: ts
      address: ["00:00:00:07:4A:59 169.254.100.63/24"]
```

```
# kubectl ko nbctl lr-route-list ovn-cluster
IPv4 Routes
  10.42.1.1      169.254.100.45 dst-ip (learned)
  10.42.1.3      100.64.0.2 dst-ip
  10.16.0.2      100.64.0.2 src-ip
  10.16.0.3      100.64.0.2 src-ip
  10.16.0.4      100.64.0.2 src-ip
  10.16.0.6      100.64.0.2 src-ip
  10.17.0.0/16    169.254.100.45 dst-ip (learned)
  100.65.0.0/16   169.254.100.45 dst-ip (learned)
```

1    Pod    ping    2    Pod IP

Subnet    disableInterConnection

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
```

```

    name: no-advertise
spec:
  cidrBlock: 10.199.0.0/16
  disableInterConnection: true

```

## 7.5.4

### CIDR

```
kube-system Namespace      ovn-ic-config ConfigMap      auto-route      false
```

```

apiVersion: v1
kind: ConfigMap
metadata:
  name: ovn-ic-config
  namespace: kube-system
data:
  enable-ic: "true"
  az-name: "az1"
  ic-db-host: "192.168.65.3"
  ic-nb-port: "6645"
  ic-sb-port: "6646"
  gw-nodes: "az1-gw"
  auto-route: "false"

```

```

[root@az1 ~]# kubectl ko nbctl show
switch a391d3a1-14a0-4841-9836-4bd930c447fb (ts)
  port ts-az1
    type: router
    router-port: az1-ts
  port ts-az2
    type: remote
    addresses: ["00:00:00:4B:E2:9F 169.254.100.31/24"]

[root@az2 ~]# kubectl ko nbctl show
switch d46138b8-de81-4908-abf9-b2224ec4edf3 (ts)
  port ts-az2
    type: router
    router-port: az2-ts
  port ts-az1
    type: remote
    addresses: ["00:00:00:FB:2A:F7 169.254.100.79/24"]

```

```
az1      az2      169.254.100.31  az2      az1      169.254.100.79
```

```
az1      CIDR  10.16.0.0/24      az2      CIDR  10.17.0.0/24
```

```
az1      az2
```

```
kubectl ko nbctl lr-route-add ovn-cluster 10.17.0.0/24 169.254.100.31
```

```
az2      az1
```

```
kubectl ko nbctl lr-route-add ovn-cluster 10.16.0.0/24 169.254.100.79
```

## 7.5.5 OVN-IC

**1**

1 Kube-OVN v1.11.16

**1**

**2**

|        |      |   |
|--------|------|---|
| OVN-IC | Raft | 3 |
|--------|------|---|

|        |        |
|--------|--------|
| OVN-IC | leader |
|--------|--------|

docker

```
docker run --name=ovn-ic-db -d --env "ENABLE_OVN_LEADER_CHECK=false" --network=host --privileged -v /etc/ovn:/etc/ovn -v /var/run/ovn:/var/run/ovn -v /var/log/ovn:/var/log/ovn -e LOCAL_IP="192.168.65.3" -e NODE_IPS="192.168.65.3,192.168.65.2,192.168.65.1" kubeovn/kube-ovn:v1.15.0 bash start-ic-db.sh
```

containerd

```
ctr -n k8s.io run -d --env "ENABLE_OVN_LEADER_CHECK=false" --net-host --privileged --mount="type=bind,src=/etc/ovn/,dst=/etc/ovn,options=rbind:rw" --mount="type=bind,src=/var/run/ovn,dst=/var/run/ovn,options=rbind:rw" --mount="type=bind,src=/var/log/ovn,dst=/var/log/ovn,options=rbind:rw" --env="NODE_IPS=192.168.65.3,192.168.65.2,192.168.65.1" --env="LOCAL_IP=192.168.65.3" docker.io/kubeovn/kube-ovn:v1.15.0 ovn-ic-db bash start-ic-db.sh
```

- LOCAL\_IP IP
- NODE\_IPS OVN-IC IP
- OVN-IC follower

docker

```
docker run --name=ovn-ic-db -d --network=host --privileged -v /etc/ovn:/etc/ovn -v /var/run/ovn:/var/run/ovn -v /var/log/ovn:/var/log/ovn -e LOCAL_IP="192.168.65.2" -e NODE_IPS="192.168.65.3,192.168.65.2,192.168.65.1" -e LEADER_IP="192.168.65.3" kubeovn/kube-ovn:v1.15.0 bash start-ic-db.sh
```

containerd

```
ctr -n k8s.io run -d --net-host --privileged --mount="type=bind,src=/etc/ovn/,dst=/etc/ovn,options=rbind:rw" --mount="type=bind,src=/var/run/ovn,dst=/var/run/ovn,options=rbind:rw" --mount="type=bind,src=/var/log/ovn,dst=/var/log/ovn,options=rbind:rw" --env="NODE_IPS=192.168.65.3,192.168.65.2,192.168.65.1" --env="LOCAL_IP=192.168.65.2" --env="LEADER_IP=192.168.65.3" docker.io/kubeovn/kube-ovn:v1.15.0 ovn-ic-db bash start-ic-db.sh
```

- LOCAL\_IP IP
- NODE\_IPS OVN-IC IP
- LEADER\_IP: OVN-IC leader IP

ovn-ic-config OVN-IC

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: ovn-ic-config
  namespace: kube-system
data:
  enable-ic: "true"
  az-name: "az1"
  ic-db-host: "192.168.65.3,192.168.65.2,192.168.65.1"
  ic-nb-port: "6645"
  ic-sb-port: "6646"
  gw-nodes: "az1-gw"
  auto-route: "true"
```

## 7.5.6 ECMP

1

ECMP ECMP path 3 ECMP path

```
kubectl edit deployment ovn-ic-server -n kube-system
```

'TS\_NUM' TS\_NUM ECMP Path

## 7.5.7

ovn-ic-config Configmap

```
kubectl -n kube-system delete cm ovn-ic-config
```

ts

```
kubectl ko nbctl ls-del ts
```

### 7.5.8 az-name

```
kubectl edit ovn-ic-config configmap az-name ovn-cni pod 10
```

```
ovn-appctl -t ovn-controller inc-engine/recompute
```

### 7.5.9

ovn-ic-config Configmap

```
kubectl -n kube-system delete cm ovn-ic-config
```

ts

```
kubectl ko nbctl ls-del ts
```

OVN-IC

docker

```
docker stop ovn-ic-db
docker rm ovn-ic-db
```

containerd

```
ctr -n k8s.io task kill ovn-ic-db
ctr -n k8s.io containers rm ovn-ic-db
```

deployment ovn-ic-server

```
kubectl delete deployment ovn-ic-server -n kube-system
```

master

DB

```
rm -f /etc/origin/ovn/ovn_ic_nb_db.db
rm -f /etc/origin/ovn/ovn_ic_sb_db.db
```

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### 7.5.10

## 7.6 Submariner



### 7.6.1

- Service CIDR CIDR

### 7.6.2 Submariner

```

subctl

curl -Ls https://get.submariner.io | bash
export PATH=$PATH:~/local/bin
echo export PATH=\$PATH:~/local/bin >> ~/.profile

kubeconfig      submariner-broker

subctl deploy-broker

cluster0      CIDR  10.16.0.0/16  join  CIDR  100.64.0.0/16  cluster1      CIDR  11.16.0.0/16  join  CIDR  100.68.0.0/16

kubeconfig  cluster0  broker  :

subctl join broker-info.subm --clusterid cluster0 --clustercidr 100.64.0.0/16,10.16.0.0/16 --natt=false --cable-driver vxlan --health-check=false
kubectl label nodes cluster0 submariner.io/gateway=true

kubeconfig  cluster1  broker  :

subctl join broker-info.subm --clusterid cluster1 --clustercidr 100.68.0.0/16,11.16.0.0/16 --natt=false --cable-driver vxlan --health-check=false
kubectl label nodes cluster1 submariner.io/gateway=true

join      gateway, routeagent pod  ,  submariner-operator  clusterrole  :

- apiGroups:
  - "apps"
  resources:
  - daemonsets
  verbs:
  - create
  - get
  - list
  - watch
  - update

subnet  ovn-default  centralized  submariner  gateway  subnet

Pod      IP

subctl

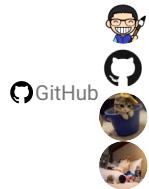
subctl show all
subctl diagnose all

Submariner      Submariner
  
```

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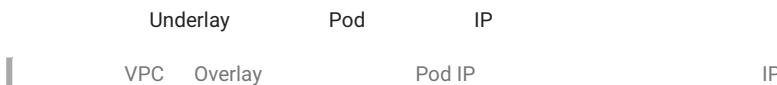
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7.6.3

---

## 7.7 Overlay



### 7.7.1

- ip\_forward
- iptables forward Drop
- ct INVALID

### 7.7.2

natOutgoing false nat Pod IP

```

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: routed
spec:
  protocol: IPv4
  cidrBlock: 10.166.0.0/16
  default: false
  excludeIps:
  - 10.166.0.1
  gateway: 10.166.0.1
  gatewayType: distributed
  natOutgoing: false
  
```

Pod

Kubernetes

```
ip route add 10.166.0.0/16 via 192.168.2.10 dev eth0
```

10.166.0.0/16 192.168.2.10 Kubernetes

| IP     | Keepalived  | VIP         | VIP         |    |
|--------|-------------|-------------|-------------|----|
| Subnet | gatewayType | centralized | gatewayNode | IP |

```

apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: routed
spec:
  protocol: IPv4
  cidrBlock: 10.166.0.0/16
  default: false
  excludeIps:
  - 10.166.0.1
  gateway: 10.166.0.1
  gatewayType: centralized
  gatewayNode: "node1"
  natOutgoing: false
  
```

nat VPC NAT

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7.7.3

---

## 7.8 Overlay

Overlay                      tunnel

- 
- 
- 

### 7.8.1

Kube-OVN                    Kubernetes Node IP

```
IFACE=eth1
```

```
ens[a-z0-9]*,eth[a-z0-9]*
```

```
kube-ovn-cni DaemonSet
```

```
args:  
- --iface=eth1
```

|   |            |       |            |
|---|------------|-------|------------|
| annotation ovn.kubernetes.io/tunnel_interface | annotation | iface | annotation |
|---|------------|-------|------------|

```
kubectl annotate node no1 ovn.kubernetes.io/tunnel_interface=ethx
```

### 7.8.2

Kube-OVN                    IP                      tunnel

- IP
- 
- Overlay

1.     Node                    IP
2.     Subnet                nodeNetwork
3.     kube-ovn-daemon        IP                    OVS
4.     Pod                    nodeNetwork        Pod                    OVS                    IP

|                                 |      |     |       |    |
|---------------------------------|------|-----|-------|----|
| ovn.kubernetes.io/node_networks | JSON | key | value | IP |
|---------------------------------|------|-----|-------|----|

```
kubectl annotate node <node-name> ovn.kubernetes.io/node_networks='{"storage": "192.168.100.10", "app": "172.16.0.10"}'
```

- storage    IP 192.168.100.10    IP
- app        IP 172.16.0.10    IP

IP

## spec.nodeNetwork

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: storage-subnet
spec:
  protocol: IPv4
  cidrBlock: 10.100.0.0/16
  gateway: 10.100.0.1
  nodeNetwork: storage
```

| storage-subnet | Pod | storage | tunnel |
|----------------|-----|---------|--------|
| nodeNetwork    |     | IP      | IFACE  |
|                |     |         | IP     |

OVS IP

OVS IP

```
ovs-vsctl get open . external-ids:ovn-encap-ip
```

IP

```
"192.168.1.10,192.168.100.10,172.16.0.10"
```

IP

```
ovs-vsctl get open . external-ids:ovn-encap-ip-default
```

POD IP

Pod Pod OVS IP

```
ovs-vsctl --columns=external_ids find interface external-ids:iface-id="<pod-name>.<namespace>"
```

nodeNetwork encap-ip

```
external_ids : {encap-ip="192.168.100.10", iface-id="test-pod.default", ...}
```

1.

- eth0 IP 192.168.1.10 192.168.1.11
- eth1 IP 10.10.10.10 10.10.10.11

```
kubectl annotate node node1 ovn.kubernetes.io/node_networks='{"storage": "10.10.10.10"}'
kubectl annotate node node2 ovn.kubernetes.io/node_networks='{"storage": "10.10.10.11"}'
```

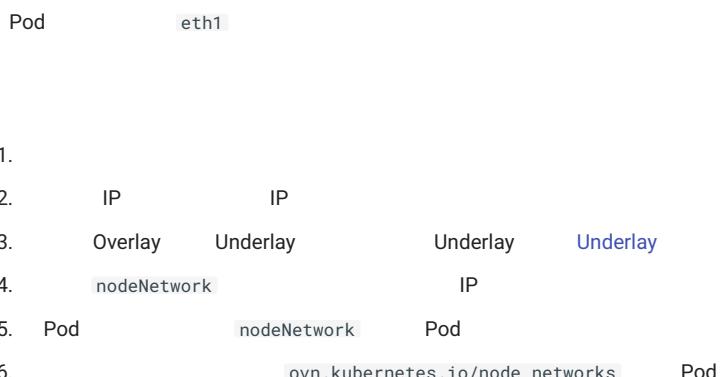
2.

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: storage-net
spec:
  protocol: IPv4
  cidrBlock: 10.200.0.0/16
  gateway: 10.200.0.1
  nodeNetwork: storage
```

```
namespaces:
- storage-namespace
```

### 3. POD

```
apiVersion: v1
kind: Pod
metadata:
  name: storage-pod
  namespace: storage-namespace
spec:
  containers:
  - name: app
    image: docker.io/library/nginx:alpine
```


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7.8.3

## 7.9 BGP



### 7.9.1 kube-ovn-speaker

kube-ovn-speaker    GoBGP

kube-ovn-speaker

```
kubectl label nodes speaker-node-1 ovn.kubernetes.io/bgp=true
kubectl label nodes speaker-node-2 ovn.kubernetes.io/bgp=true
```

kube-ovn-speaker

ECMP

yaml:

```
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/release-1.15/yamls/speaker.yaml
```

yaml

```
- --neighbor-address=10.32.32.254
- --neighbor-ipv6-address=2409:AB00:AB00:2000::AFB:8AFE
- --neighbor-as=65030
- --cluster-as=65000
```

```
- --neighbor-address=10.32.32.252,10.32.32.253
- --neighbor-ipv6-address=2409:AB00:AB00:2000::AFB:8AFC,2409:AB00:AB00:2000::AFB:8AFD
- --neighbor-as=65030
- --cluster-as=65000
```

- neighbor-address: BGP Peer
- neighbor-as: BGP Peer AS
- cluster-as: AS

yaml:

```
kubectl apply -f speaker.yaml
```

### 7.9.2 Pod/Subnet

BGP              Subnet    natOutgoing    false    Pod IP

annotation

```
kubectl annotate pod sample ovn.kubernetes.io/bgp=true
kubectl annotate subnet ovn-default ovn.kubernetes.io/bgp=true
```

annotation

```
kubectl annotate pod sample ovn.kubernetes.io/bgp-
kubectl annotate subnet ovn-default ovn.kubernetes.io/bgp-
```

BGP

### 7.9.3 ClusterIP Service

```
Service ClusterIP      kube-ovn-speaker   --announce-cluster-ip   true          BGP
```

annotation

```
kubectl annotate service sample ovn.kubernetes.io/bgp=true
```

annotation

```
kubectl annotate service sample ovn.kubernetes.io/bgp-
```

### 7.9.4 EIPs

|                 |                 |                     |                             |             |     |        |         |
|-----------------|-----------------|---------------------|-----------------------------|-------------|-----|--------|---------|
| EIPs            | VPC NAT Gateway | VpcNatGateway       | BGP                         | BGP Sidecar |     |        |         |
| VPC NAT Gateway | BGP             | BGP Speaker Sidecar | NetworkAttachmentDefinition | NAD         | VPC | Subnet | Sidecar |
| Kubernetes API  | EIPs            | VPC                 | CoreDNS                     | NAD         |     |        |         |

NetworkAttachmentDefinition Subnet provider {nadName}.{nadNamespace}.ovn

```
apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: api-ovn-nad
  namespace: default
spec:
  config: '{'
    "cniVersion": "0.3.0",
    "type": "kube-ovn",
    "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
    "provider": "api-ovn-nad.default.ovn"
  '}'
---
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: vpc-apiserver-subnet
spec:
  protocol: IPv4
  cidrBlock: 100.100.100.0/24
  provider: api-ovn-nad.default.ovn
```

ovn-vpc-nat-config ConfigMap apiNadProvider BGP Speaker :

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: ovn-vpc-nat-config
  namespace: kube-system
data:
  apiNadProvider: api-ovn-nad.default.ovn           # What NetworkAttachmentDefinition provider to use so that the sidecar
                                                    # can access the K8S API, as it can't by default due to VPC segmentation
  bgpSpeakerImage: docker.io/kubeovn/kube-ovn:v1.13.0 # Sets the BGP speaker image used
  image: docker.io/vpc-nat-gateway:v1.13.0
```

ovn-default provider

```
provider: api-ovn-nad.default.ovn
```

VPC NAT Gateway BGP

```
kind: VpcNatGateway
apiVersion: kubeovn.io/v1
metadata:
  name: vpc-natgw
spec:
  vpc: vpc1
  subnet: net1
  lanIp: 10.0.1.10
  bgpSpeaker:
    enabled: true
    asn: 65500
    remoteAsn: 65000
    neighbors:
      - 100.127.4.161
      - fd:01::1
    enableGracefulRestart: true # Optional
```

```

routerId: 1.1.1.1      # Optional
holdTime: 1m           # Optional
password: "password123" # Optional
extraArgs:             # Optional, passed directly to the BGP speaker
  - -v5                # Enables verbose debugging of the BGP speaker sidecar
selector:
  - "kubernetes.io/os: linux"
externalSubnets:
  - ovn-vpc-external-network # Network on which we'll speak BGP and receive/send traffic to the outside world
                                # BGP neighbors need to be on that network

```

BGP EIP

```
kubectl annotate eip sample ovn.kubernetes.io/bgp=true
```

## 7.9.5

| kube-ovn-speaker                |   |                           |                      |                                  |         |      |         |         |     |  |  |
|---------------------------------|---|---------------------------|----------------------|----------------------------------|---------|------|---------|---------|-----|--|--|
| • Cluster:                      |   | speaker                   | Pod IPs/Subnet CIDRs |                                  | IP      | CIDR | Pod     | speaker | Pod |  |  |
|                                 |   | Pod                       | Subnet               |                                  |         |      |         |         |     |  |  |
| • Local:                        |   | Pod IPs                   | Pod                  |                                  | Cluster |      | Pod     |         |     |  |  |
|                                 | : | Local                     |                      | kube-ovn-speaker                 | Pod     |      | speaker |         |     |  |  |
|                                 |   | Cluster                   | Pod/Subnet           | annotation ovn.kubernetes.io/bgp |         |      |         |         |     |  |  |
| • ovn.kubernetes.io/bgp=cluster |   | ovn.kubernetes.io/bgp=yes |                      | Cluster                          |         |      |         |         |     |  |  |
| • ovn.kubernetes.io/bgp=local   |   | Local                     |                      |                                  |         |      |         |         |     |  |  |
|                                 |   | Service                   | kube-proxy           | ClusterIP                        | Service |      | Cluster |         |     |  |  |

## 7.9.6 BGP

| kube-ovn-speaker BGP              |                                    |             |
|-----------------------------------|------------------------------------|-------------|
| • announce-cluster-ip:            | Service                            | false       |
| • auth-password:                  | BGP peer                           |             |
| • holdtime:                       | BGP                                | 90          |
| • graceful-restart:               | BGP Graceful Restart               |             |
| • graceful-restart-time:          | BGP Graceful restart time          | RFC4724 3   |
| • graceful-restart-deferral-time: | BGP Graceful restart deferral time | RFC4724 4.1 |
| • passivemode:                    | Speaker passive                    | peer        |
| • ebgp-multipath:                 | ebgp ttl                           | 1           |

## 7.9.7 BGP routes debug

```

# show peer neighbor
gobgp neighbor

# show announced routes to one peer
gobgp neighbor 10.32.32.254 adj-out

```

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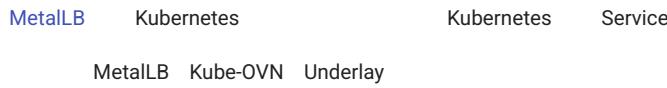
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7.9.8

---

## 7.10 MetalLB Kube-OVN Underlay

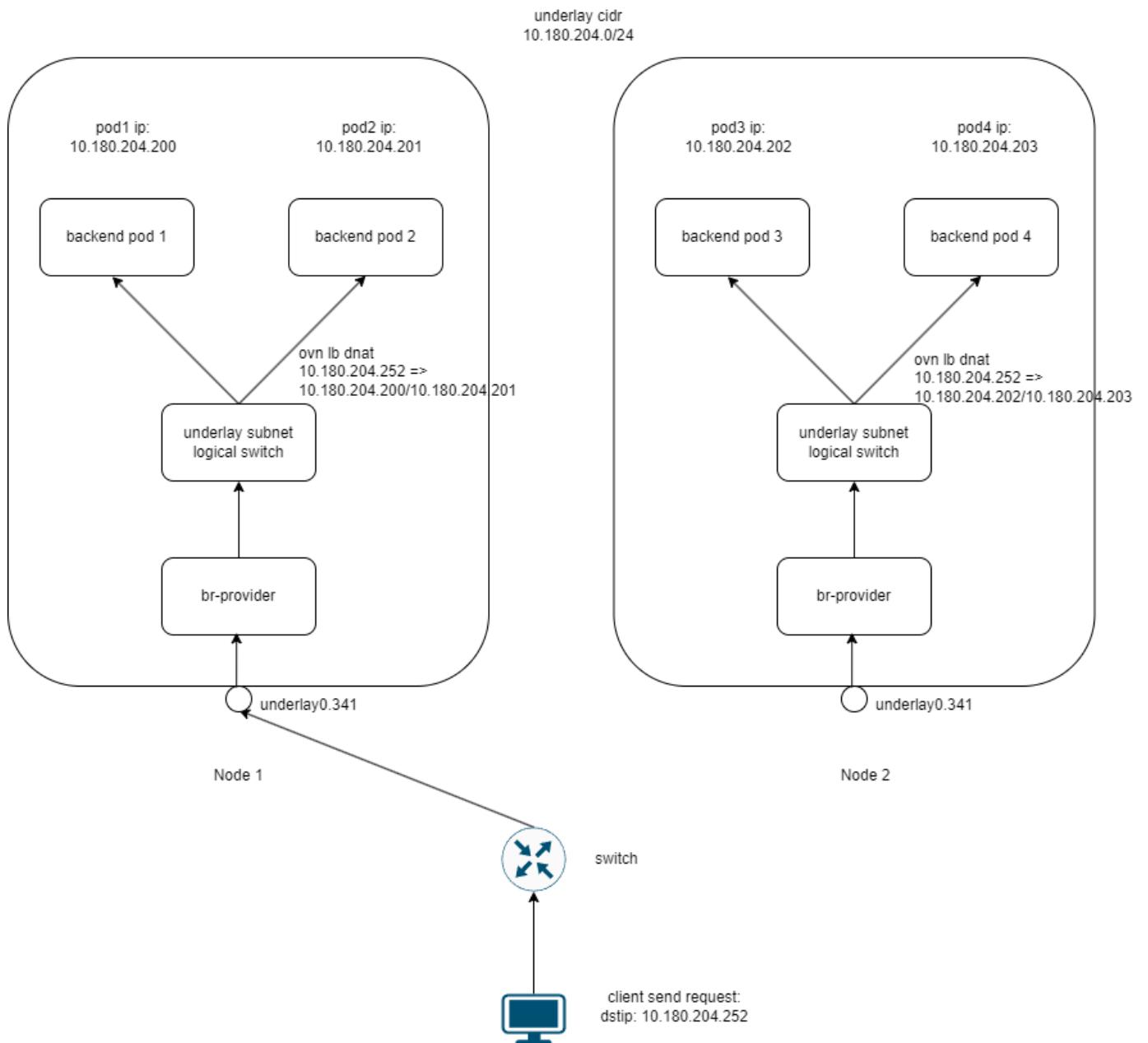


### 7.10.1

Kube-OVN 1.14.0 MetalLB Underlay

- MetalLB IP
- Pod MetalLB VIP Underlay
- IP SNAT

### 7.10.2



### 1 MetalLB VIP Kube-OVN Underlay

MetalLB Kube-OVN Underlay

```

1.          VIP    10.180.204.252   IP  MetalLB    L2           Node1  metallb  VIP
2.          VIP            underlay0.341
3.      br-provider    Underlay
4. br-provider  OpenFlow        OVN
5. underlay subnet      OVN       ovn lb dnat
6. OVN             Pod
10.180.204.0/24  VIP    Pod  IP

```

### 7.10.3

- Kube-OVN --enable-ovn-lb-prefer-local=true
- Underlay enableExternalLBAddress=true
- Underlay excludeIps MetalLB IP

### 7.10.4

#### 1. Kube-OVN

```
Kube-OVN  Kube-OVN  --enable-ovn-lb-prefer-local=true  --ls-ct-skip-dst-lport-ips=false
```

```
# kube-ovn-controller Deployment
kubectl edit deployment -n kube-system kube-ovn-controller
```

```
--enable-ovn-lb-prefer-local=true
--ls-ct-skip-dst-lport-ips=false
```

#### 2. Underlay

```
Underlay      LoadBalancer      excludeIps  MetalLB    IP
```

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: underlay-subnet
spec:
  protocol: IPv4
  provider: ovn
  cidrBlock: 10.180.204.0/24 #
  gateway: 10.180.204.1
  excludeIps:
  - 10.180.204.250
  - 10.180.204.251
  - 10.180.204.252 # MetalLB      VIP 10.180.204.252
  natOutgoing: false
  enableExternalLBAddress: true  #      subnet  cidr  ip      metallb vip
```

#### 3. MetalLB

```
MetalLB      MetalLB
```

```
kubectl apply -f https://raw.githubusercontent.com/metallb/metallb/v0.13.7/config/manifests/metallb-native.yaml
```

```
MetalLB      L2
```

```
apiVersion: metallb.io/v1beta1
kind: IPAddressPool
metadata:
```

```

    name: underlay-pool
    namespace: metallb-system
spec:
  addresses:
  - 10.180.204.250-10.180.204.254 #      VIP 10.180.204.252
---
apiVersion: metallb.io/v1beta1
kind: L2Advertisement
metadata:
  name: l2-advert
  namespace: metallb-system
spec:
  ipAddressPools:
  - underlay-pool

```

#### 4. LoadBalancer Service

LoadBalancer    Service    Underlay    Pod

```

apiVersion: apps/v1
kind: Deployment
metadata:
  labels:
    app: nginx
  name: deploy-16940264
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      annotations:
        ovn.kubernetes.io/logical_switch: underlay-subnet
      labels:
        app: nginx
    spec:
      containers:
        - args:
            - netexec
            - --http-port
            - "80"
          image: kubeovn/agnhost:2.47
          imagePullPolicy: IfNotPresent
          name: nginx
---
apiVersion: v1
kind: Service
metadata:
  name: nginx-lb
spec:
  externalTrafficPolicy: Local
  ipFamilies:
  - IPv4
  ipFamilyPolicy: PreferDualStack
  ports:
  - port: 80
    protocol: TCP
    targetPort: 80
  selector:
    app: nginx
  type: LoadBalancer

```

### 7.10.5

1. Service    MetalLB    IP

```
kubectl get svc nginx-lb
```

EXTERNAL-IP    IP    10.180.204.252

1.    Service    IP

```
curl http://10.180.204.252
```

1.              Pod

Service endpoints Pod

```
#   Service   endpoints
kubectl get endpoints nginx-lb
```

```
# Pod
kubectl get pods -l app=nginx -o wide
```

## 1. IP

nginx Pod IP IP SNAT IP

```
kubectl exec -it $(kubectl get pods -l app=nginx -o name | head -n1) -- cat /var/log/nginx/access.log
```

## 7.10.6

IP

|         |          |      |          |            |    |
|---------|----------|------|----------|------------|----|
| MetalLB | Underlay | CIDR | Underlay | excludeIps | IP |
|---------|----------|------|----------|------------|----|

|         |                   |               |      |      |     |             |
|---------|-------------------|---------------|------|------|-----|-------------|
| MetalLB | Kube-OVN Underlay | underlay0.341 | VLAN | VLAN | ARP | MetalLB VIP |
|---------|-------------------|---------------|------|------|-----|-------------|

|            |                                   |           |                              |
|------------|-----------------------------------|-----------|------------------------------|
| - Kube-OVN | --enable-ovn-lb-prefer-local=true | - Service | externalTrafficPolicy: Local |
|------------|-----------------------------------|-----------|------------------------------|

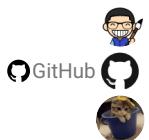
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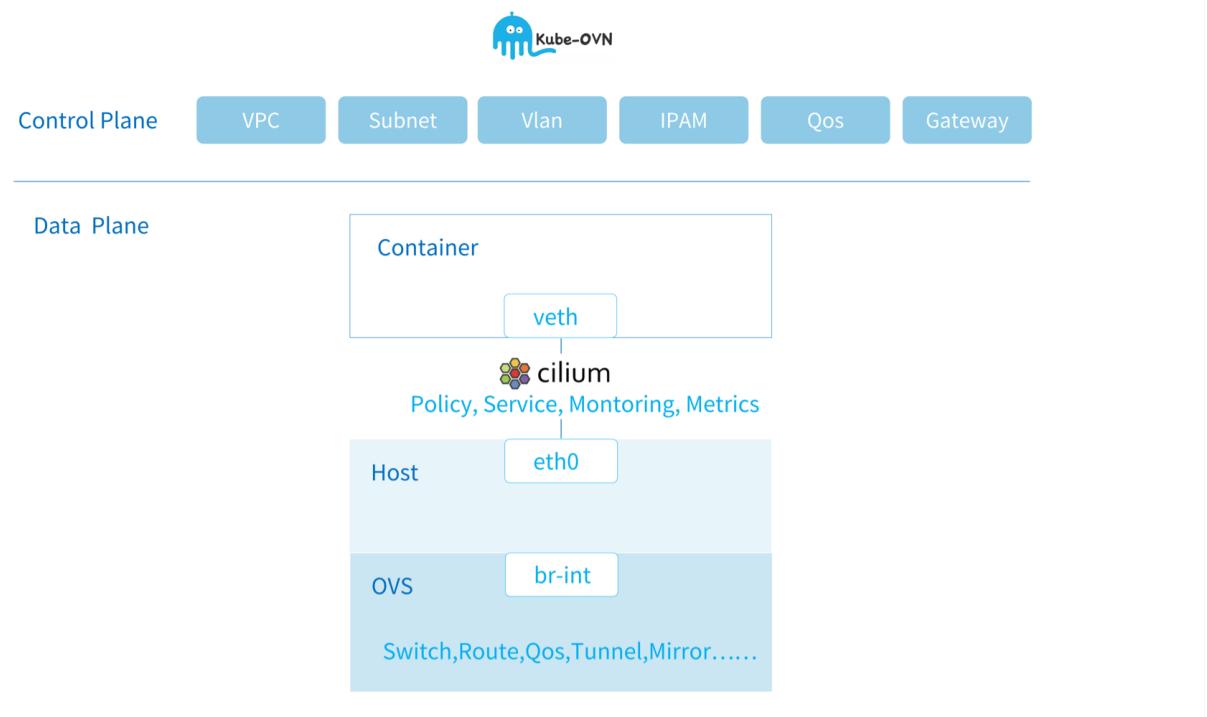
## 7.10.7

## 7.11 Cilium

Cilium eBPF Kube-OVN CNI Chaining Kube-OVN eBPF

Cilium Kube-OVN

- Hubble



### 7.11.1

1. Linux 4.19 eBPF  
2. Helm Cilium Helm [Installing Helm](#)

### 7.11.2 Kube-OVN

Cilium Kube-OVN networkpolicy CNI

```
install.sh
```

```
ENABLE_NP=false
CNI_CONFIG_PRIORITY=10
```

```
kube-ovn-controller networkpolicy
```

```
args:
- --enable-np=false
```

```
kube-ovn-cni CNI
```

```
args:
- --cni-conf-name=10-kube-ovn.conflist
```

Kube-OVN

Cilium

```
mv /etc/cni/net.d/01-kube-ovn.conflist /etc/cni/net.d/10-kube-ovn.conflist
```

### 7.11.3 Cilium

chaining.yaml Cilium generic-veth

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: cni-configuration
  namespace: kube-system
data:
  cni-config: |-
    {
      "name": "generic-veth",
      "cniVersion": "0.3.1",
      "plugins": [
        {
          "type": "kube-ovn",
          "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
          "ipam": {
            "type": "kube-ovn",
            "server_socket": "/run/openvswitch/kube-ovn-daemon.sock"
          }
        },
        {
          "type": "portmap",
          "snat": true,
          "capabilities": {"portMappings": true}
        },
        {
          "type": "cilium-cni"
        }
      ]
    }
```

```
kubectl apply -f chaining.yaml
```

Helm Cilium

```
helm repo add cilium https://helm.cilium.io/
helm install cilium cilium/cilium --version 1.11.6 \
  --namespace kube-system \
  --set cni.chainingMode=generic-veth \
  --set cni.customConf=true \
  --set cni.configMap=cni-configuration \
  --set tunnel=disabled \
  --set enableIPv4Masquerade=false \
  --set devices="eth+ ovn0 genev_sys_6081 vxlan_sys_4789" \
  --set enableIdentityMark=false
```

Cilium

```
# cilium status
  /--\
 /--\ /--\   Cilium:      OK
 \--/ \--/   Operator:    OK
 /--\ /--\   Hubble:     disabled
 \--/ \--\   ClusterMesh: disabled
   \--/

DaemonSet      cilium      Desired: 2, Ready: 2/2, Available: 2/2
Deployment     cilium-operator Desired: 2, Ready: 2/2, Available: 2/2
Containers:    cilium      Running: 2
               cilium-operator Running: 2
Cluster Pods: 8/11 managed by Cilium
Image versions cilium      quay.io/cilium/cilium:v1.10.5@sha256:0612218e28288db360c63677c09fafafa2d17edda4f13867bcabf87056046b33bb: 2
               cilium-operator quay.io/cilium/operator-generic:v1.10.5@sha256:2d2f730f219d489ff0702923bf24c0002cd93eb4b47ba344375566202f56d972: 2
```

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7.11.4

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## 7.12 Cilium NetworkPolicy

|          |        |              |
|----------|--------|--------------|
| Kube-OVN | Cilium | Cilium       |
| Cilium   | Cilium | Cilium L3 L4 |

### 7.12.1

#### Pod

namespace test yaml test namespace label app=test Pod Pod

```
apiVersion: apps/v1
kind: Deployment
metadata:
  labels:
    app: test
  name: test
  namespace: test
spec:
  replicas: 1
  selector:
    matchLabels:
      app: test
  strategy:
    rollingUpdate:
      maxSurge: 25%
      maxUnavailable: 25%
    type: RollingUpdate
  template:
    metadata:
      labels:
        app: test
    spec:
      containers:
        - image: docker.io/library/nginx:alpine
          imagePullPolicy: IfNotPresent
          name: nginx
```

yaml default namespace label app=dynamic Pod Pod

```
apiVersion: apps/v1
kind: Deployment
metadata:
  labels:
    app: dynamic
  name: dynamic
  namespace: default
spec:
  replicas: 2
  selector:
    matchLabels:
      app: dynamic
  strategy:
    rollingUpdate:
      maxSurge: 25%
      maxUnavailable: 25%
    type: RollingUpdate
  template:
    metadata:
      creationTimestamp: null
    labels:
      app: dynamic
    spec:
      containers:
        - image: docker.io/library/nginx:alpine
          imagePullPolicy: IfNotPresent
          name: nginx
```

Pod Label :

```
# kubectl get pod -o wide --show-labels
NAME           READY   STATUS    RESTARTS   AGE     IP          NODE          NOMINATED NODE   READINESS GATES   LABELS
dynamic-7d8d7874f5-9v5c4   1/1    Running   0          28h    10.16.0.35   kube-ovn-worker   <none>       <none>
template-hash=7d8d7874f5
dynamic-7d8d7874f5-s822n   1/1    Running   0          28h    10.16.0.36   kube-ovn-control-plane   <none>       <none>
template-hash=7d8d7874f5
# kubectl get pod -o wide -n test --show-labels
NAME           READY   STATUS    RESTARTS   AGE     IP          NODE          NOMINATED NODE   READINESS GATES   LABELS
dynamic-7d8d7874f5-6ds96   1/1    Running   0          7h20m  10.16.0.2    kube-ovn-control-plane   <none>       <none>
template-hash=7d8d7874f5
```

```

dynamic-7d8d7874f5-tjgtp  1/1  Running  0   7h46m  10.16.0.42  kube-ovn-worker  <none>    <none>    app=dynamic,pod-
template-hash=7d8d7874f5
label-test1-77b6764857-sq4k  1/1  Running  0   3h43m  10.16.0.12  kube-ovn-worker  <none>    <none>    app=test1,pod-
template-hash=77b6764857

// Pod
test-54c98bc466-mft5s  1/1  Running  0   8h     10.16.0.41  kube-ovn-worker  <none>    <none>    app=test,pod-
template-hash=54c98bc466

```

**L3**

`yaml CiliumNetworkPolicy :`

```

apiVersion: "cilium.io/v2"
kind: CiliumNetworkPolicy
metadata:
  name: "l3-rule"
  namespace: test
spec:
  endpointSelector:
    matchLabels:
      app: test
  ingress:
  - fromEndpoints:
    - matchLabels:
      app: dynamic

```

| default namespace | Pod | Pod | test namespace | Pod |
|-------------------|-----|-----|----------------|-----|
|-------------------|-----|-----|----------------|-----|

`default namespace :`

```

# kubectl exec -it dynamic-7d8d7874f5-9v5c4 -- bash
bash-5.0# ping -c 3 10.16.0.41
PING 10.16.0.41 (10.16.0.41): 56 data bytes
--- 10.16.0.41 ping statistics ---
3 packets transmitted, 0 packets received, 100% packet loss

```

`test namespace Pod :`

```

# kubectl exec -it -n test dynamic-7d8d7874f5-6dsg6 -- bash
bash-5.0# ping -c 3 10.16.0.41
PING 10.16.0.41 (10.16.0.41): 56 data bytes
64 bytes from 10.16.0.41: seq=0 ttl=64 time=2.558 ms
64 bytes from 10.16.0.41: seq=1 ttl=64 time=0.223 ms
64 bytes from 10.16.0.41: seq=2 ttl=64 time=0.304 ms

--- 10.16.0.41 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.223/1.028/2.558 ms

```

| Cilium | CiliumNetworkPolicy | Namespace | Cilium |
|--------|---------------------|-----------|--------|
|--------|---------------------|-----------|--------|

| Namespace | Pod | Namespace | Pod |
|-----------|-----|-----------|-----|
|-----------|-----|-----------|-----|

| Namespace | Namespace |
|-----------|-----------|
|-----------|-----------|

`CiliumNetworkPolicy namespace :`

```

ingress:
- fromEndpoints:
  - matchLabels:
    app: dynamic
    k8s.io.kubernetes.pod.namespace: default // Namespace Pod

```

`CiliumNetworkPolicy :`

```

# kubectl get cnp -n test -o yaml l3-rule
apiVersion: cilium.io/v2
kind: CiliumNetworkPolicy
metadata:
  name: l3-rule
  namespace: test
spec:
  endpointSelector:
    matchLabels:
      app: test
  ingress:
  - fromEndpoints:
    - matchLabels:

```

```
app: dynamic
- matchLabels:
  app: dynamic
k8s:io.kubernetes.pod.namespace: default
```

default namespace Pod Pod :

```
# kubectl exec -it dynamic-7d8d7874f5-9v5c4 -n test -- bash
bash-5.0# ping -c 3 10.16.0.41
PING 10.16.0.41 (10.16.0.41): 56 data bytes
64 bytes from 10.16.0.41: seq=0 ttl=64 time=2.383 ms
64 bytes from 10.16.0.41: seq=1 ttl=64 time=0.115 ms
64 bytes from 10.16.0.41: seq=2 ttl=64 time=0.142 ms

--- 10.16.0.41 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.115/0.880/2.383 ms
```

| Kubernetes | <a href="#">networkpolicy</a> | Cilium | Namespace | Namespace  | Pod | Namespace | Namespace | Pod |
|------------|-------------------------------|--------|-----------|------------|-----|-----------|-----------|-----|
| Kube-OVN   | Kube-OVN                      | k8s    | Namespace | <b>Pod</b> | Pod | Namespace | Namespace | Pod |
| Pod        |                               |        |           |            |     |           |           |     |

## L4

yaml L4 :

```
apiVersion: "cilium.io/v2"
kind: CiliumNetworkPolicy
metadata:
  name: "14-rule"
  namespace: test
spec:
  endpointSelector:
    matchLabels:
      app: test
  ingress:
  - fromEndpoints:
    - matchLabels:
      app: dynamic
    toPorts:
    - ports:
      - port: "80"
        protocol: TCP
```

Namespace Pod

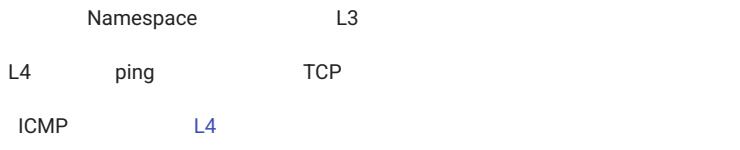
```
# kubectl exec -it -n test dynamic-7d8d7874f5-6dsg6 -- bash
bash-5.0# ping -c 3 10.16.0.41
PING 10.16.0.41 (10.16.0.41): 56 data bytes

--- 10.16.0.41 ping statistics ---
3 packets transmitted, 0 packets received, 100% packet loss
bash-5.0#
bash-5.0# curl 10.16.0.41:80
<html>
<head>
  <title>Hello World!</title>
  <link href='//fonts.googleapis.com/css?family=Open+Sans:400,700' rel='stylesheet' type='text/css'>
  <style>
  body {
    background-color: white;
    text-align: center;
    padding: 50px;
    font-family: "Open Sans", "Helvetica Neue", Helvetica, Arial, sans-serif;
  }
  #logo {
    margin-bottom: 40px;
  }
  </style>
</head>
<body>
  <h1>Hello World!</h1>
  <h3>Links found</h3>
  <h3>I am on test-54c98bc466-mft5s</h3>
  <h3>Cookie
    <b>KUBERNETES</b> listening in 443 available at tcp://10.96.0.1:443<br />
    <h3>my name is hanhouchao!</h3>
    <h3> RequestURI='/'</h3>
  </body>
</html>
```

## Namespace Pod

```
# kubectl exec -it -n test label-test1-77b6764857-sqw4k -- bash
bash-5.0# ping -c 3 10.16.0.41
PING 10.16.0.41 (10.16.0.41): 56 data bytes

--- 10.16.0.41 ping statistics ---
3 packets transmitted, 0 packets received, 100% packet loss
bash-5.0#
bash-5.0# curl -v 10.16.0.41:80 --connect-timeout 10
* Trying 10.16.0.41:80...
* After 1000ms connect time, move on!
* connect to 10.16.0.41 port 80 failed: Operation timed out
* Connection timeout after 10001 ms
* Closing connection 0
curl: (28) Connection timeout after 10001 ms
```



L7

## chaining L7 Cilium Generic Veth Chaining

issue 12454



2025 9 10

Q+2022 8 2



## 7.12.2

## 7.13 Cilium

```
Kube-OVN      Cilium      Cilium
          Cilium      Hubble      Hubble
```

### 7.13.1 Hubble

```
Cilium      Hubble      Hubble
```

```
helm      Hubble
```

```
helm upgrade cilium cilium/cilium --version 1.11.6 \
--namespace kube-system \
--reuse-values \
--set hubble.relay.enabled=true \
--set hubble.ui.enabled=true
```

```
Hubble      cilium status      Hubble
```

```
# cilium status
  /--\
 /--\ /--\ Cilium:      OK
 \--\ /--\ Operator:    OK
 /--\ /--\ Hubble:      OK
 \--\ /--\ ClusterMesh: disabled
  \--\

Deployment      hubble-relay      Desired: 1, Ready: 1/1, Available: 1/1
Deployment      cilium-operator   Desired: 2, Ready: 2/2, Available: 2/2
DaemonSet       cilium           Desired: 2, Ready: 2/2, Available: 2/2
Deployment      hubble-ui        Desired: 1, Ready: 1/1, Available: 1/1
Containers:    cilium           Running: 2
               hubble-ui         Running: 1
               hubble-relay       Running: 1
               cilium-operator    Running: 2
Cluster Pods: 16/17 managed by Cilium
Image versions  hubble-relay     quay.io/cilium/hubble-relay:v1.11.6@sha256:fd9034a2d04d5b973f1e8ed44f230ea195b89c37955ff32e34e5aa68f3ed675a: 1
                cilium-operator  quay.io/cilium/operator-generic:v1.11.6@sha256:9f6063c7bcaede801a39315ec7c166309f6a6783e98665f669393cf1701bc17: 2
                cilium           quay.io/cilium/cilium:v1.11.6@sha256:f7f93c26739b6641a3fa3d76b1e1605b15989f25d06625260099e01c8243f54c: 2
                hubble-ui         quay.io/cilium/hubble-ui:v0.9.0@sha256:0ef04e9a29212925da6dfdb0a5b581765e41a01fcc30563cef9b30b457fea0: 1
                hubble-ui         quay.io/cilium/hubble-ui-backend:v0.9.0@sha256:000df6b76719f607a9edefb9af94fdf1811a6f1b6a8a9c537cba90bf12df474b: 1
apple@bogon cilium %
```

```
Hubble      Hubble CLI :
```

```
curl -L --fail --remote-name-all https://github.com/cilium/hubble/releases/download/v0.10.0/hubble-linux-amd64.tar.gz
sudo tar xzvfC hubble-linux-amd64.tar.gz /usr/local/bin
```

### 7.13.2

```
Cilium
```

```
cilium connectivity test Cilium      cilium-test Namespace      cilium-test
```

```
cilium-test namespace
```

```
# kubectl get all -n cilium-test
NAME                  READY  STATUS  RESTARTS  AGE
pod/client-7df6cfbf7b-z5t2j  1/1   Running  0          21s
pod/client2-547996d7db-nvgxg  1/1   Running  0          21s
pod/echo-other-node-d79544ccf-h14gg  2/2   Running  0          21s
pod/echo-same-node-5d466d5444-m17tc  2/2   Running  0          21s

NAME              TYPE      CLUSTER-IP      EXTERNAL-IP      PORT(S)      AGE
service/echo-other-node  NodePort  10.109.58.126  <none>        8080:32269/TCP  21s
service/echo-same-node  NodePort  10.188.70.32   <none>        8080:32490/TCP  21s

NAME                  READY  UP-TO-DATE  AVAILABLE  AGE
deployment.apps/client  1/1   1          1          21s
deployment.apps/client2  1/1   1          1          21s
deployment.apps/echo-other-node  1/1   1          1          21s
deployment.apps/echo-same-node  1/1   1          1          21s

NAME                  DESIRED  CURRENT  READY  AGE

```

```
replicaset.apps/client-7df6cfbf7b      1   1   1   21s
replicaset.apps/client2-547996d7d8     1   1   1   21s
replicaset.apps/echo-other-node-d79544ccf 1   1   1   21s
replicaset.apps/echo-same-node-5d466d5444 1   1   1   21s
```

### 7.13.3

| Cilium                                   | kube-system namespace | Cilium  | pod      | hubble observe |            |                        |                |                 |
|--|-----------------------|---------|----------|----------------|------------|------------------------|----------------|-----------------|
| # kubectl get pod -n kube-system -o wide |                       |         |          |                |            |                        |                |                 |
| NAME                                     | READY                 | STATUS  | RESTARTS | AGE            | IP         | NODE                   | NOMINATED NODE | READINESS GATES |
| cilium-d6h56                             | 1/1                   | Running | 0        | 2d20h          | 172.18.0.2 | kube-ovn-worker        | <none>         | <none>          |
| cilium-operator-5887f78bbb-c7sb2         | 1/1                   | Running | 0        | 2d20h          | 172.18.0.2 | kube-ovn-worker        | <none>         | <none>          |
| cilium-operator-5887f78bbb-wj8gt         | 1/1                   | Running | 0        | 2d20h          | 172.18.0.3 | kube-ovn-control-plane | <none>         | <none>          |
| cilium-tq5xb                             | 1/1                   | Running | 0        | 2d20h          | 172.18.0.3 | kube-ovn-control-plane | <none>         | <none>          |
| kube-ovn-pinger-7lgk8                    | 1/1                   | Running | 0        | 21h            | 10.16.0.19 | kube-ovn-control-plane | <none>         | <none>          |
| kube-ovn-pinger-msvcn                    | 1/1                   | Running | 0        | 21h            | 10.16.0.18 | kube-ovn-worker        | <none>         | <none>          |

```
# kubectl exec -it -n kube-system cilium-d6h56 -- bash
root@kube-ovn-worker:/home/cilium# hubble observe --from-namespace kube-system
Jul 29 03:24:25.551: kube-system/kube-ovn-pinger-msvcn:35576 -> 172.18.0.3:6642 to-stack FORWARDED (TCP Flags: ACK, PSH)
Jul 29 03:24:25.561: kube-system/kube-ovn-pinger-msvcn:35576 -> 172.18.0.3:6642 to-stack FORWARDED (TCP Flags: RST)
Jul 29 03:24:25.561: kube-system/kube-ovn-pinger-msvcn:35576 -> 172.18.0.3:6642 to-stack FORWARDED (TCP Flags: ACK, RST)
Jul 29 03:24:25.572: kube-system/kube-ovn-pinger-msvcn:35578 -> 172.18.0.3:6642 to-stack FORWARDED (TCP Flags: SYN)
Jul 29 03:24:25.572: kube-system/kube-ovn-pinger-msvcn:35578 -> 172.18.0.3:6642 to-stack FORWARDED (TCP Flags: ACK)
Jul 29 03:24:25.651: kube-system/kube-ovn-pinger-msvcn:35578 -> 172.18.0.3:6642 to-stack FORWARDED (TCP Flags: ACK, PSH)
Jul 29 03:24:25.661: kube-system/kube-ovn-pinger-msvcn:35578 -> 172.18.0.3:6642 to-stack FORWARDED (TCP Flags: RST)
Jul 29 03:24:25.661: kube-system/kube-ovn-pinger-msvcn:35578 -> 172.18.0.3:6642 to-stack FORWARDED (TCP Flags: ACK, RST)
Jul 29 03:24:25.761: kube-system/kube-ovn-pinger-msvcn:52004 -> 172.18.0.3:6443 to-stack FORWARDED (TCP Flags: ACK, PSH)
Jul 29 03:24:25.779: kube-system/kube-ovn-pinger-msvcn -> kube-system/kube-ovn-pinger-7lgk8 to-stack FORWARDED (ICMPv4 EchoRequest)
Jul 29 03:24:25.779: kube-system/kube-ovn-pinger-msvcn <- kube-system/kube-ovn-pinger-7lgk8 to-endpoint FORWARDED (ICMPv4 EchoReply)
Jul 29 03:24:25.866: kube-system/hubble-ui-7596f7ffff-7j6f2:55836 <- kube-system/hubble-relay-959988db5-zc5vv:4245 to-stack FORWARDED (TCP Flags: ACK)
Jul 29 03:24:25.866: kube-system/hubble-ui-7596f7ffff-7j6f2:55836 <- kube-system/hubble-relay-959988db5-zc5vv:80 to-endpoint FORWARDED (TCP Flags: ACK)
Jul 29 03:24:25.866: kube-system/hubble-ui-7596f7ffff-7j6f2:55836 -> kube-system/hubble-relay-959988db5-zc5vv:4245 to-stack FORWARDED (TCP Flags: ACK)
Jul 29 03:24:25.866: kube-system/hubble-ui-7596f7ffff-7j6f2:55836 -> kube-system/hubble-relay-959988db5-zc5vv:4245 to-endpoint FORWARDED (TCP Flags: ACK)
Jul 29 03:24:25.975: kube-system/kube-ovn-pinger-7lgk8 -> kube-system/kube-ovn-pinger-msvcn to-endpoint FORWARDED (ICMPv4 EchoRequest)
Jul 29 03:24:25.975: kube-system/kube-ovn-pinger-7lgk8 <- kube-system/kube-ovn-pinger-msvcn to-stack FORWARDED (ICMPv4 EchoReply)
Jul 29 03:24:25.979: kube-system/kube-ovn-pinger-msvcn -> 172.18.0.3 to-stack FORWARDED (ICMPv4 EchoRequest)
Jul 29 03:24:26.037: kube-system/coredns-6d4b75cb6d-lbgjg:36430 -> 172.18.0.3:6443 to-stack FORWARDED (TCP Flags: ACK)
Jul 29 03:24:26.282: kube-system/kube-ovn-pinger-msvcn -> 172.18.0.2 to-stack FORWARDED (ICMPv4 EchoRequest)
```

Hubble Relay Hubble

```
Hubble API          Hubble Service      kubectl port-forward deployment/hubble-relay -n kube-system 4245:4245
```

```
kubectl port-forward
```

```
hubble status
```

```
# hubble status
Healthcheck (via localhost:4245): Ok
Current/Max Flows: 8,190/8,190 (100.00%)
Flows/s: 22.86
Connected Nodes: 2/2
```

```

hubble observe          cilium-test
apple@bogon ovn-test % hubble observe
Jul 28 08:00:07.033: cilium-test/client-7df6cfbf7b-qn7q6:56906 (ID:15432) -> kube-system/coredns-6d4b75cb6d-b444j:53 (ID:11307) to-endpoint FORWARDED (UDP)
Jul 28 08:00:07.033: cilium-test/client-7df6cfbf7b-qn7q6:56906 (ID:15432) -> kube-system/coredns-6d4b75cb6d-b444j:53 (ID:11307) to-stack FORWARDED (UDP)
Jul 28 08:00:07.095: 100.64.0.3:43037 (world) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: SYN)
Jul 28 08:00:07.095: 100.64.0.3:43037 (world) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-stack FORWARDED (TCP Flags: SYN, ACK)
Jul 28 08:00:07.096: 100.64.0.3:43037 (world) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK)
Jul 28 08:00:07.096: 100.64.0.3:43037 (world) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK, FIN)
Jul 28 08:00:07.096: 100.64.0.3:43037 (world) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-stack FORWARDED (TCP Flags: ACK, FIN)
Jul 28 08:00:07.097: 100.64.0.3:43037 (world) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK)
Jul 28 08:00:07.249: 100.64.0.2:33419 (host) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: SYN)
Jul 28 08:00:07.249: 100.64.0.2:33419 (host) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-stack FORWARDED (TCP Flags: SYN, ACK)
Jul 28 08:00:07.250: 100.64.0.2:33419 (host) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK)
Jul 28 08:00:07.251: 100.64.0.2:33419 (host) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK, FIN)
Jul 28 08:00:07.251: 100.64.0.2:33419 (host) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-stack FORWARDED (TCP Flags: ACK, FIN)
Jul 28 08:00:07.251: 100.64.0.2:33419 (host) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK)
Jul 28 08:00:07.323: cilium-test/client2-547996d7d8-jgb1c:34927 (ID:14804) -> 172.18.0.3:31514 (kube-apiserver) to-endpoint FORWARDED (TCP Flags: SYN, ACK)
Jul 28 08:00:07.323: cilium-test/client2-547996d7d8-jgb1c:34927 (ID:14804) -> 172.18.0.3:31514 (kube-apiserver) to-stack FORWARDED (TCP Flags: ACK)
Jul 28 08:00:07.324: 100.64.0.2:34927 (world) -> cilium-test/echo-same-node-5d466d5444-4v1lm:8080 (ID:15976) to-endpoint FORWARDED (TCP Flags: ACK)
Jul 28 08:00:07.324: cilium-test/client2-547996d7d8-jgb1c:34927 (ID:14804) -> 172.18.0.3:31514 (kube-apiserver) to-stack FORWARDED (TCP Flags: ACK, FIN)
Jul 28 08:00:07.324: 100.64.0.2:34927 (world) -> cilium-test/echo-same-node-5d466d5444-4v1lm:8080 (ID:15976) to-endpoint FORWARDED (TCP Flags: ACK, FIN)
Jul 28 08:00:07.324: cilium-test/client2-547996d7d8-jgb1c:34927 (ID:14804) -> 172.18.0.3:31514 (kube-apiserver) to-endpoint FORWARDED (TCP Flags: ACK, FIN)
Jul 28 08:00:07.324: cilium-test/client2-547996d7d8-jgb1c:34927 (ID:14804) -> 172.18.0.3:31514 (kube-apiserver) to-stack FORWARDED (TCP Flags: ACK)
Jul 28 08:00:07.324: 100.64.0.2:34927 (world) -> cilium-test/echo-same-node-5d466d5444-4v1lm:8080 (ID:15976) to-endpoint FORWARDED (TCP Flags: ACK)
Jul 28 08:00:07.324: cilium-test/client2-547996d7d8-jgb1c:34927 (ID:14804) -> 172.18.0.3:31514 (kube-apiserver) to-stack FORWARDED (TCP Flags: ACK)
Jul 28 08:00:07.324: 100.64.0.2:34927 (world) -> cilium-test/echo-same-node-5d466d5444-4v1lm:8080 (ID:15976) to-endpoint FORWARDED (TCP Flags: ACK, PSH)
Jul 28 08:00:07.324: cilium-test/hubble-relay-959988db5-zc5vv:46938 (ID:53347) -> 172.18.0.2:4244 (kube-apiserver) to-stack FORWARDED (TCP Flags: ACK, PSH)
Jul 28 08:00:07.340: cilium-test/hubble-relay-959988db5-zc5vv:46938 (ID:53347) -> 172.18.0.2:4244 (host) to-endpoint FORWARDED (TCP Flags: ACK, PSH)
Jul 28 08:00:07.340: cilium-test/hubble-relay-959988db5-zc5vv:46938 (ID:53347) -> 172.18.0.2:4244 (host) to-endpoint FORWARDED (TCP Flags: ACK, PSH)
Jul 28 08:00:07.341: cilium-test/hubble-relay-959988db5-zc5vv:44656 (ID:53347) -> 172.18.0.3:4244 (kube-apiserver) to-endpoint FORWARDED (TCP Flags: ACK, PSH)
Jul 28 08:00:07.409: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-stack FORWARDED (TCP Flags: SYN)
Jul 28 08:00:07.409: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: SYN)
Jul 28 08:00:07.409: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-stack FORWARDED (TCP Flags: SYN, ACK)
Jul 28 08:00:07.410: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: SYN, ACK)
Jul 28 08:00:07.410: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-stack FORWARDED (TCP Flags: ACK, PSH)
Jul 28 08:00:07.410: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK, PSH)
Jul 28 08:00:07.410: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK, PSH)
Jul 28 08:00:07.411: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK, PSH)
Jul 28 08:00:07.411: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK, PSH)
Jul 28 08:00:07.412: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK, FIN)
Jul 28 08:00:07.412: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK, FIN)
Jul 28 08:00:07.412: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK, FIN)
Jul 28 08:00:07.412: cilium-test/client-7df6cfbf7b-qn7q6:57326 (ID:15432) -> cilium-test/echo-other-node-d79544ccf-r688b:8080 (ID:50956) to-endpoint FORWARDED (TCP Flags: ACK, FIN)
apple@bogon ovn-test %

```

hubble observe

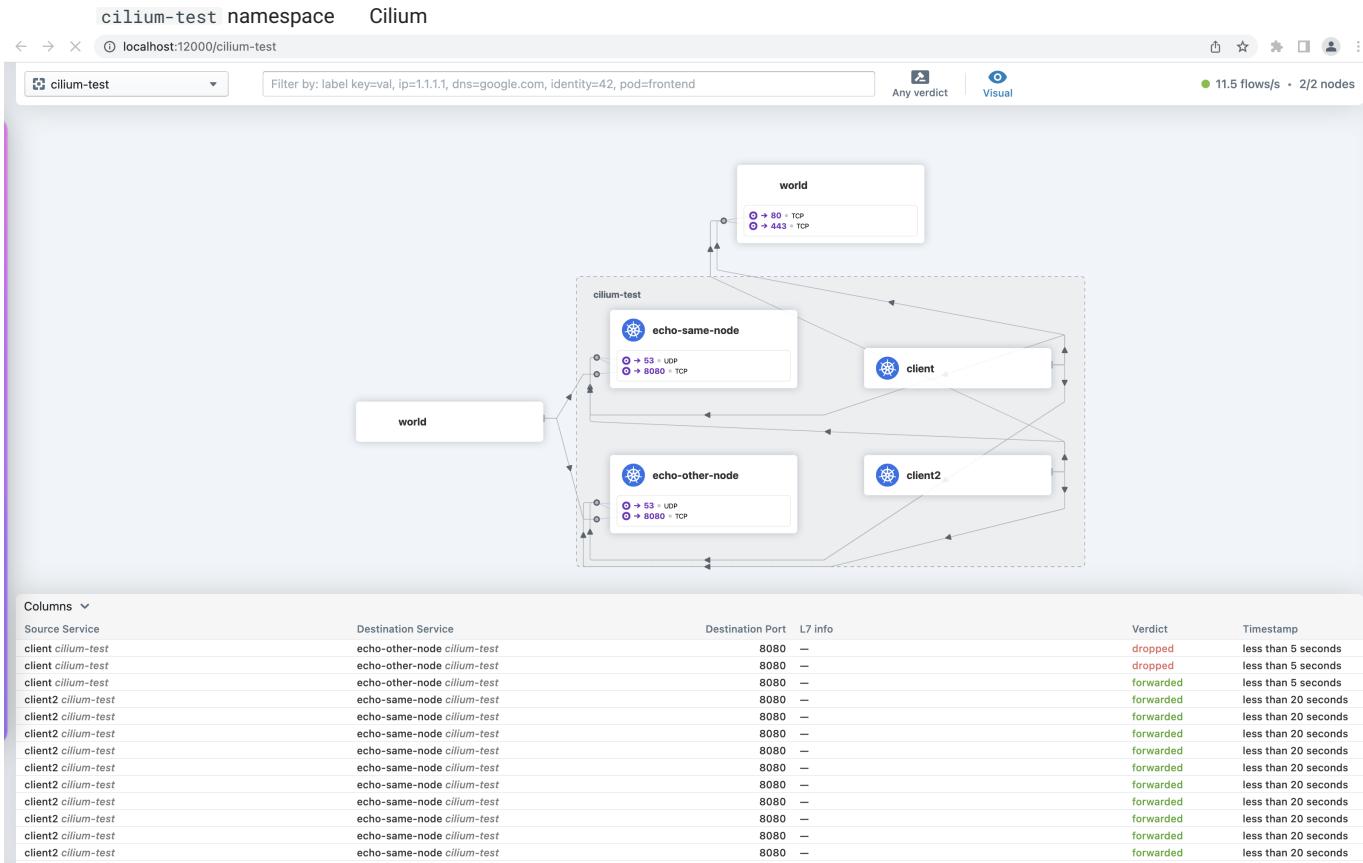
hubble help observe

Hubble CLI

### 7.13.4 UI

| cilium status    | Hubble UI         | Hubble | UI | Hubble UI |
|------------------|-------------------|--------|----|-----------|
| cilium hubble ui | hubble-ui service |        |    |           |

http://localhost:12000 UI



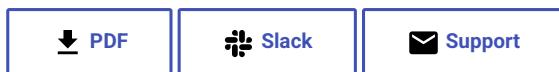
### 7.13.5 Hubble

Hubble Pod Hubble

```
helm upgrade cilium cilium/cilium --version 1.11.6 \
--namespace kube-system \
--reuse-values \
--set hubble.relay.enabled=true \
--set hubble.ui.enabled=true \
--set hubble.metrics.enabled='{dns,drop,tcp,flow,icmp,http}'
```

**kube-system** namespace      **hubble-metrics**      **Endpoints**      **Hubble**

```
# curl 172.18.0.2:9091/metrics
# HELP hubble_drop_total Number of drops
# TYPE hubble_drop_total counter
hubble_drop_total{protocol="ICMPv6",reason="Unsupported L3 protocol"} 2
# HELP hubble_flows_processed_total Total number of flows processed
# TYPE hubble_flows_processed_total counter
hubble_flows_processed_total{protocol="ICMPv4",subtype="to-endpoint",type="Trace",verdict="FORWARDED"} 335
hubble_flows_processed_total{protocol="ICMPv4",subtype="to-stack",type="Trace",verdict="FORWARDED"} 335
hubble_flows_processed_total{protocol="ICMPv6",subtype="",type="Drop",verdict="DROPPED"} 2
hubble_flows_processed_total{protocol="TCP",subtype="to-endpoint",type="Trace",verdict="FORWARDED"} 8282
hubble_flows_processed_total{protocol="TCP",subtype="to-stack",type="Trace",verdict="FORWARDED"} 6767
hubble_flows_processed_total{protocol="UDP",subtype="to-endpoint",type="Trace",verdict="FORWARDED"} 1642
hubble_flows_processed_total{protocol="UDP",subtype="to-stack",type="Trace",verdict="FORWARDED"} 1642
# HELP hubble_icmp_total Number of ICMP messages
# TYPE hubble_icmp_total counter
hubble_icmp_total{family="IPv4",type="EchoReply"} 335
hubble_icmp_total{family="IPv4",type="EchoRequest"} 335
hubble_icmp_total{family="IPv4",type="RouterSolicitation"} 2
# HELP hubble_tcp_flags_total TCP flag occurrences
# TYPE hubble_tcp_flags_total counter
hubble_tcp_flags_total{family="IPv4",flag="FIN"} 2043
hubble_tcp_flags_total{family="IPv4",flag="RST"} 301
hubble_tcp_flags_total{family="IPv4",flag="SYN"} 1169
hubble_tcp_flags_total{family="IPv4",flag="SYN-ACK"} 1169
```



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7.13.6

---

## 7.14

### Kube-OVN

#### 7.14.1

```
kind: Subnet
apiVersion: kubeovn.io/v1
metadata:
  name: external
spec:
  cidrBlock: 172.31.0.0/16
  gatewayType: centralized
  natOutgoing: false
  externalEgressGateway: 192.168.0.1
  policyRoutingTableID: 1000
  policyRoutingPriority: 1500
```

- natOutgoing: false
- externalEgressGateway
- policyRoutingTableID TableID
- policyRoutingPriority

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 GitHub 

#### 7.14.2

## 7.15 VIP IP

```

VIP   IP      IP      VIP   kube-ovn IP  POD          IP      IP      VIP      Openstack neutron Allowed-Address-Pairs
AAP      Openstack octavia           POD IP      aliyun terway      neutron   IP      VIP      VIP
POD   IP      VIP   IP          OVN   Switch LB      IP   LB   VIP      VIP   OVN
Switch LB Rule      VIP

```

- Allowed-Address-Pairs VIP
- Switch LB rule VIP
- Pod VIP IP

### 7.15.1 1. Allowed-Address-Pairs VIP

```

IP      Pod
• Kubernetes  Kubernetes  Kubernetes  Underlay  Subnet
• LB          Subnet   IP      Pod
VIP      Allowed-Address-Pairs  IP      IP
• Keepalived  IP

```

#### 1.1 VIP

IP IP yaml

```

apiVersion: kubeovn.io/v1
kind: Vip
metadata:
  name: vip-dynamic-01
spec:
  subnet: ovn-default
  type: ""

```

- subnet: Subnet IP
- type: ipam ip switch\_lb\_vip vip switch lb vip ip

VIP

```

# kubectl get vip
NAME      V4IP      PV4IP    MAC      PMAC      V6IP      PV6IP    SUBNET    READY
vip-dynamic-01  10.16.0.12  00:00:00:F0:DB:25

```

VIP 10.16.0.12 IP

#### 1.2 VIP

VIP IP yaml

```

apiVersion: kubeovn.io/v1
kind: Vip
metadata:
  name: static-vip01
spec:
  subnet: ovn-default
  v4ip: "10.16.0.121"

```

- subnet: Subnet IP
- v4ip: IP subnet CIDR

VIP

```
# kubectl get vip
NAME      V4IP      PV4IP      MAC          PMAC      V6IP      PV6IP      SUBNET      READY
static-vip01  10.16.0.121  00:00:00:F0:DB:26  ovn-default  true
```

VIP IP

### 1.3 Pod VIP AAP

| Pod            | annotation | VIP | AAP | labels | VIP   |
|----------------|------------|-----|-----|--------|---|
| Pod annotation |            | VIP |     |        | ovn.kubernetes.io/aaps: vip-aap,vip-aap2,vip-aap3 |
| AAP            |            | Pod | AAP | Pod    | VIP subnet Port                                   |

#### 1.3.1 VIP AAP

```
apiVersion: kubeovn.io/v1
kind: Vip
metadata:
  name: vip-aap
spec:
  subnet: ovn-default
  namespace: default
  selector:
    - "app: aap1"
```

VIP

- namespace : AAP      VIP      VIP      AAP
- selector : AAP      VIP      Pod      Kubernetes      NodeSelector

VIP      Port

```
# kubectl ko nbctl show ovn-default
switch e32e1d3b-c539-45f4-ab19-be4e33a061f6 (ovn-default)
  port aap-vip
    type: virtual
```

```
apiVersion: v1
kind: Pod
metadata:
  name: busybox
  annotations:
    ovn.kubernetes.io/aaps: vip-aap
  labels:
    app: aap1
spec:
  containers:
    - name: busybox
      image: busybox
      command: ["sleep", "3600"]
      securityContext:
        capabilities:
          add:
            - NET_ADMIN
```

AAP

```
# kubectl ko nbctl list logical_switch_port aap-vip
_uuid      : cd930750-0533-4f06-a6c0-217ddac73272
addresses  : []
dhcpv4_options : []
dhcpv6_options : []
dynamic_addresses : []
enabled   : []
external_ids : {ls=ovn-default, vendor=kube-ovn}
ha_chassis_group : []
mirror_rules : []
name       : aap-vip
options    : {virtual-ip="10.16.0.100", virtual-parents="busybox.default"}
parent_name : []
port_security : []
tag        : []
tag_request : []
type       : virtual
up         : false
```

virtual-ip      VIP      IP virtual-parents      AAP      Pod      Port

## Pod

```
# kubectl exec -it busybox -- ip addr add 10.16.0.100/16 dev eth0
# kubectl exec -it busybox01 -- ip addr show eth0
35: eth0@if36: <BROADCAST,MULTICAST,UP,LOWER_UP,M-DOWN> mtu 1400 qdisc noqueue
    link/ether 00:00:00:e2:ab:0c brd ff:ff:ff:ff:ff:ff
    inet 10.16.0.7/16 brd 10.16.255.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet 10.16.0.100/16 scope global secondary eth0
        valid_lft forever preferred_lft forever
    inet6 fe80::200:ff:fee2:ab0c/64 scope link
        valid_lft forever preferred_lft forever
```

| Pod | IP | VIP | IP | subnet | Pod | IP |
|-----|----|-----|----|--------|-----|----|
|-----|----|-----|----|--------|-----|----|

## 7.15.2 2. Switch LB rule vip

```
apiVersion: kubeovn.io/v1
kind: Vip
metadata:
  name: slr-01
spec:
  subnet: ovn-default
  type: switch_lb_vip

  • subnet: Subnet IP
  • type: ipam ip switch_lb_vip vip switch lb vip ip
```

## 7.15.3 3. Pod VIP IP

v1.12

IP

```
apiVersion: kubeovn.io/v1
kind: Vip
metadata:
  name: pod-use-vip
spec:
  subnet: ovn-default
  type: ""
```

| annotation | VIP | Pod |
|------------|-----|-----|
|------------|-----|-----|

```
apiVersion: v1
kind: Pod
metadata:
  name: static-ip
  annotations:
    ovn.kubernetes.io/vip: pod-use-vip #   vip
    namespace: default
spec:
  containers:
    - name: static-ip
      image: docker.io/library/nginx:alpine
```

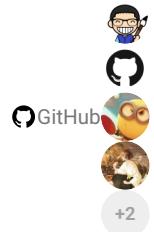
## 3.1 StatefulSet Kubevirt VM VIP

| StatefulSet | VM  | Pod                 | VIP                         |
|-------------|-----|---------------------|-----------------------------|
| VM          | VIP | kube-ovn-controller | keep-vm-ip true Kubevirt VM |

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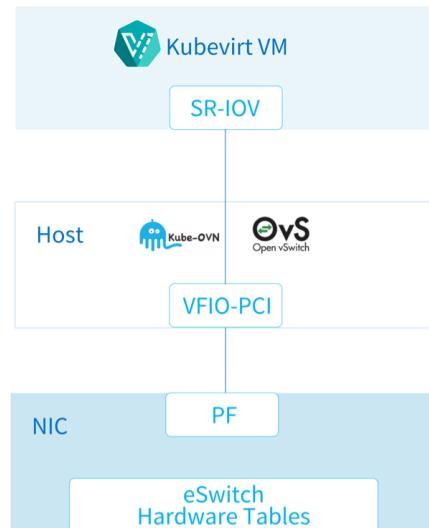


7.15.4

---

## 7.16 Mellanox Offload

|                                 |     |         |     |          |                                  |
|---------------------------------|-----|---------|-----|----------|----------------------------------|
| Kube-OVN                        | OVS | CPU     | CPU | Mellanox | Accelerated Switching And Packet |
| Processing (ASAP <sup>2</sup> ) | OVS | eSwitch | OVS | CPU      |                                  |



Note

2022

### 7.16.1

- Mellanox CX5/CX6/CX7/BlueField      ASAP<sup>2</sup>
- CentOS 8 Stream      Linux 5.7
- dp\_hash      hash      OVN LB
- bond

### 7.16.2 SR-IOV Device Plugin

|          |         |                      |   |
|----------|---------|----------------------|---|
| Mellanox | offload | SR-IOV Device Plugin | <a href="#">srivio-network-operator</a> |
|----------|---------|----------------------|---|

#### SR-IOV Device Plugin

SR-IOV

ID      84:00.0      84.00.1

```
# lspci -nn | grep ConnectX-5
84:00.0 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5] [15b3:1017]
84:00.1 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5] [15b3:1017]
```

## ID

```
# ls -l /sys/class/net/ | grep 84:00.0
lrwxrwxrwx 1 root root 0 Feb 4 16:16 enp132s0f0np0 -> ../../devices/pci0000:80/0000:80:08.0/0000:84:00.0/net/enp132s0f0np0
# ls -l /sys/class/net/ | grep 84:00.1
lrwxrwxrwx 1 root root 0 Feb 4 16:16 enp132s0f1np1 -> ../../devices/pci0000:80/0000:80:08.0/0000:84:00.1/net/enp132s0f1np1
```

## bond

```
enp132s0f0np0 enp132s0f1np1 bond1
```

```
# ip link show enp132s0f0np0 | grep bond
160: enp132s0f0np0: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 1500 qdisc mq master bond1 state UP mode DEFAULT group default qlen 1000
# ip link show enp132s0f1np1 | grep bond
169: enp132s0f1np1: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 1500 qdisc mq master bond1 state UP mode DEFAULT group default qlen 1000
```

## bond VF

```
ifenslave -d bond1 enp132s0f0np0
ifenslave -d bond1 enp132s0f1np1
echo 0 > /sys/class/net/enp132s0f0np0/device/sriov_numvfs
echo 0 > /sys/class/net/enp132s0f1np1/device/sriov_numvfs
ip link set enp132s0f0np0 down
ip link set enp132s0f1np1 down
```

## OVS

## SMFS DMFS

- SMFS (software-managed flow steering)
- DMFS (device-managed flow steering)

## sysfs devlink API

```
# sysfs
echo <smfs|dmfs> > /sys/class/net/enp132s0f0np0/compat/devlink/steering_mode
echo <smfs|dmfs> > /sys/class/net/enp132s0f1np1/compat/devlink/steering_mode
# devlink
devlink dev param set pci/84:00.0 name flow_steering_mode value smfs cmode runtime
devlink dev param set pci/84:00.1 name flow_steering_mode value smfs cmode runtime
```

## VF

```
# cat /sys/class/net/enp132s0f0np0/device/sriov_totalvfs
127
# cat /sys/class/net/enp132s0f1np1/device/sriov_totalvfs
127
```

## VF

```
# echo '4' > /sys/class/net/enp132s0f0np0/device/sriov_numvfs
# echo '4' > /sys/class/net/enp132s0f1np1/device/sriov_numvfs
# ip link show enp132s0f0np0
160: enp132s0f0np0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc mq state DOWN mode DEFAULT group default qlen 1000
    link/ether 00:c0:eb:74:c3:4b brd ff:ff:ff:ff:ff:ff
    vf 0 link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff, spoof checking off, link-state disable, trust off, query_rss off
    vf 1 link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff, spoof checking off, link-state disable, trust off, query_rss off
    vf 2 link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff, spoof checking off, link-state disable, trust off, query_rss off
    vf 3 link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff, spoof checking off, link-state disable, trust off, query_rss off
# ip link show enp132s0f1np1
169: enp132s0f1np1: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc mq state DOWN mode DEFAULT group default qlen 1000
    link/ether 00:c0:eb:74:c3:4b brd ff:ff:ff:ff:ff:ff
    vf 0 link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff, spoof checking off, link-state disable, trust off, query_rss off
    vf 1 link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff, spoof checking off, link-state disable, trust off, query_rss off
    vf 2 link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff, spoof checking off, link-state disable, trust off, query_rss off
    vf 3 link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff, spoof checking off, link-state disable, trust off, query_rss off
# ip link set enp132s0f0np0 up
# ip link set enp132s0f1np1 up
```

## VF ID

```
# lspci -nn | grep ConnectX-5 | grep Virtual
84:00.2 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
84:00.3 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
84:00.4 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
```

```
84:00.5 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
84:00.6 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
84:00.7 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
84:01.0 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
84:01.1 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
```

VF

```
echo 0000:84:00.2 > /sys/bus/pci/drivers/mlx5_core/unbind  
echo 0000:84:00.3 > /sys/bus/pci/drivers/mlx5_core/unbind  
echo 0000:84:00.4 > /sys/bus/pci/drivers/mlx5_core/unbind  
echo 0000:84:00.5 > /sys/bus/pci/drivers/mlx5_core/unbind  
echo 0000:84:00.6 > /sys/bus/pci/drivers/mlx5_core/unbind  
echo 0000:84:00.7 > /sys/bus/pci/drivers/mlx5_core/unbind  
echo 0000:84:01.0 > /sys/bus/pci/drivers/mlx5_core/unbind  
echo 0000:84:01.1 > /sys/bus/pci/drivers/mlx5_core/unbind
```

eSwitch

```
devlink dev eswitch set pci@0000:84:00.0 mode switchdev  
devlink dev eswitch set pci@0000:84:00.1 mode switchdev  
ethtool -K enp13s0f0np0 hw-tc-offload on  
ethtool -K enp13s0f1np1 hw-tc-offload on
```

SR-IOV VF

- Active-backup
  - XOR
  - LACP



## LACP

```
modprobe bonding mode=802.3ad
ip link set enp132s0f0np0 master bond1
ip link set enp132s0f1np1 master bond1
ip link set enp132s0f0np0 up
ip link set enp132s0f1np1 up
ip link set bond1 up
```



VF

```
echo 0000:84:00.2 > /sys/bus/pci/drivers/mlx5_core/bind  
echo 0000:84:00.3 > /sys/bus/pci/drivers/mlx5_core/bind  
echo 0000:84:00.4 > /sys/bus/pci/drivers/mlx5_core/bind  
echo 0000:84:00.5 > /sys/bus/pci/drivers/mlx5_core/bind  
echo 0000:84:00.6 > /sys/bus/pci/drivers/mlx5_core/bind  
echo 0000:84:00.7 > /sys/bus/pci/drivers/mlx5_core/bind  
echo 0000:84:01.0 > /sys/bus/pci/drivers/mlx5_core/bind  
echo 0000:84:01.1 > /sys/bus/pci/drivers/mlx5_core/bind
```

## NetworkManager

NetworkManager

```
systemctl stop NetworkManager  
systemctl disable NetworkManager
```

## DEVICE PLUGIN

VF

Pod VF

SR-IOV Device Plugin

SR-IOV Configmap

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: sriovdp-config
  namespace: kube-system
data:
  config.json: |
```

```
{
  "resourceList": [
    {
      "resourcePrefix": "mellanox.com",
      "resourceName": "cx5_sriov_switchdev",
      "selectors": {
        "vendors": ["15b3"],
        "devices": ["1018"],
        "drivers": ["mlx5_core"]
      }
    }
  ]
}
```

SR-IOV Device Plugin      ConfigMap      ConfigMap name sriovdp-config

- **selectors:VF**
- **vendors:**
- **devices:**
- **drivers:**

selectors    pciAddresses acpiIndexes    VF      SR-IOV ConfigMap

## SR-IOV

```
kubectl apply -f https://raw.githubusercontent.com/k8snetworkplumbingwg/sriov-network-device-plugin/v3.6.2/deployments/sriovdp-daemonset.yaml
```

SR-IOV      Kubernetes Node

```
kubectl describe node kube-ovn-01 | grep mellanox

mellanox.com/cx5_sriov_switchdev: 8
mellanox.com/cx5_sriov_switchdev: 8
mellanox.com/cx5_sriov_switchdev 0 0
```

## sriov-network-operator    SR-IOV Device Plugin

### node-feature-discovery

```
kubectl apply -k https://github.com/kubernetes-sigs/node-feature-discovery/deployment/overlays/default?ref=v0.11.3
```

offload      annotation:

```
kubectl label nodes [offloadNicNode] feature.node.kubernetes.io/network-sriov.capable=true
```

### Operator

```
git clone --depth=1 https://github.com/kubeovn/sriov-network-operator.git
kubectl apply -k sriov-network-operator/deploy
```

### Operator

```
# kubectl get -n kube-system all | grep sriov
NAME READY STATUS RESTARTS AGE
pod/sriov-network-config-daemon-bf9nt 1/1 Running 0 8s
pod/sriov-network-operator-54d7545f65-296gb 1/1 Running 0 10s

NAME DESIRED CURRENT READY UP-TO-DATE AVAILABLE NODE
SELECTOR AGE
daemonset.apps/sriov-network-config-daemon 1 1 1 1 1 beta.kubernetes.io/os=linux,feature.node.kubernetes.io/network-sriov.capable=true 8s

NAME READY UP-TO-DATE AVAILABLE AGE
deployment.apps/sriov-network-operator 1/1 1 1 10s

NAME DESIRED CURRENT READY AGE
replicaset.apps/sriov-network-operator-54d7545f65 1 1 1 10s
```

SriovNetworkNodeState    node1      Mellanox

```
# kubectl get sriovnetworknodestates.sriovnetwork.openshift.io -n kube-system node1 -o yaml
apiVersion: sriovnetwork.openshift.io/v1
kind: SriovNetworkNodeState
spec: ...
```

```

status:
  interfaces:
    - deviceID: "1017"
      driver: mlx5_core
      mtu: 1500
      pciAddress: "0000:5f:00.0"
      totalvfs: 8
      vendor: "15b3"
      linkSeed: 25000Mb/s
      linkType: ETH
      mac: 08:c0:eb:f4:85:bb
      name: ens41f0np0
    - deviceID: "1017"
      driver: mlx5_core
      mtu: 1500
      pciAddress: "0000:5f:00.1"
      totalvfs: 8
      vendor: "15b3"
      linkSeed: 25000Mb/s
      linkType: ETH
      mac: 08:c0:eb:f4:85:bb
      name: ens41f1np1

```

#### SriovNetworkNodePolicy      nicSelector

```

apiVersion: sriovnetwork.openshift.io/v1
kind: SriovNetworkNodePolicy
metadata:
  name: policy
  namespace: kube-system
spec:
  nodeSelector:
    feature.node.kubernetes.io/network-sriov.capable: "true"
  eSwitchMode: switchdev
  numVfs: 3
  nicSelector:
    pfNames:
      - ens41f0np0
      - ens41f1np1
  resourceName: cx_sriov_switchdev

```

#### SriovNetworkNodeState      status

```

# kubectl get sriovnetworknodestates.sriovnetwork.openshift.io -n kube-system node1 -o yaml

...
spec:
  interfaces:
    - eSwitchMode: switchdev
      name: ens41f0np0
      numVfs: 3
      pciAddress: 0000:5f:00.0
      vfGroups:
        - policyName: policy
          vfRange: 0-2
          resourceName: cx_sriov_switchdev
    - eSwitchMode: switchdev
      name: ens41f1np1
      numVfs: 3
      pciAddress: 0000:5f:00.1
      vfGroups:
        - policyName: policy
          vfRange: 0-2
          resourceName: cx_sriov_switchdev
  status:
    interfaces
      - Vfs:
          - deviceID: 1018
            driver: mlx5_core
            pciAddress: 0000:5f:00.2
            vendor: "15b3"
          - deviceID: 1018
            driver: mlx5_core
            pciAddress: 0000:5f:00.3
            vendor: "15b3"
          - deviceID: 1018
            driver: mlx5_core
            pciAddress: 0000:5f:00.4
            vendor: "15b3"
            deviceID: "1017"
            driver: mlx5_core
            linkSeed: 25000Mb/s
            linkType: ETH
            mac: 08:c0:eb:f4:85:ab
            mtu: 1500
            name: ens41f0np0
            numVfs: 3
            pciAddress: 0000:5f:00.0
            totalvfs: 3
            vendor: "15b3"
      - Vfs:

```

```

- deviceID: 1018
  driver: mlx5_core
  pciAddress: 0000:5f:00.5
  vendor: "15b3"
- deviceID: 1018
  driver: mlx5_core
  pciAddress: 0000:5f:00.6
  vendor: "15b3"
- deviceID: 1018
  driver: mlx5_core
  pciAddress: 0000:5f:00.7
  vendor: "15b3"
deviceID: "1017"
driver: mlx5_core
linkSeed: 25000Mb/s
linkType: ETH
mac: 08:c0:eb:f4:85:bb
mtu: 1500
name: ens41f1np1
numVfs: 3
pciAddress: 0000:5f:00.1
totalvfs: 3
vendor: "15b3"

```

## VF

```

# lspci -nn | grep ConnectX
5f:00.0 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5] [15b3:1017]
5f:00.1 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5] [15b3:1017]
5f:00.2 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
5f:00.3 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
5f:00.4 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
5f:00.5 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
5f:00.6 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]
5f:00.7 Ethernet controller [0200]: Mellanox Technologies MT27800 Family [ConnectX-5 Virtual Function] [15b3:1018]

```

## PF

```

# cat /sys/class/net/ens41f0np0/compat/devlink/mode
switchdev

```

## 7.16.3 Multus-CNI

| SR-IOV Device Plugin | ID | Multus-CNI | Kube-OVN | Multus-CNI |
|----------------------|----|------------|----------|------------|
|----------------------|----|------------|----------|------------|

### Multus-CNI

```
kubectl apply -f https://raw.githubusercontent.com/k8snetworkplumbingwg/multus-cni/v4.0.2/deployments/multus-daemonset-thick.yml
```

|        |      |       |        |       |
|--------|------|-------|--------|-------|
| multus | Thin | Thick | SR-IOV | Thick |
|--------|------|-------|--------|-------|

### NetworkAttachmentDefinition

```

apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: sriov
  namespace: default
  annotations:
    k8s.v1.cni.cncf.io/resourceName: mellanox.com/cx5_sriov_switchdev
spec:
  config: '{
    "cniVersion": "0.3.1",
    "name": "kube-ovn",
    "plugins": [
      {
        "type": "kube-ovn",
        "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
        "provider": "sriov.default.ovn"
      },
      {
        "type": "portmap",
        "capabilities": {
          "portMappings": true
        }
      }
    ]
}'

```

- provider: NetworkAttachmentDefinition {name}.{namespace}.ovn

## 7.16.4 Overlay

### Kube-OVN

```
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/release-1.15/dist/images/install.sh
```

| IFACE                                  | IP                  |
|--|---------------------|
| ENABLE_MIRROR=\${ENABLE_MIRROR:-false} |                     |
| HW_OFFLOAD=\${HW_OFFLOAD:-true}        |                     |
| ENABLE_LB=\${ENABLE_LB:-false}         |                     |
| IFACE="bond1"                          |                     |
| # SR-IOV Device Plugin                 | bond                |
|  | IFACE bond1         |
|  | bond                |
|  | IFACE enp132s0f0np0 |
|  | enp132s0f1np1       |

### Kube-OVN

```
bash install.sh
```

### VF Pod

yaml VF Pod:

```
apiVersion: v1
kind: Pod
metadata:
  name: nginx-overlay
  annotations:
    v1.multus-cni.io/default-network: default/sriov
    sriov.default.ovn.kubernetes.io/logical_switch: ovn-default
spec:
  containers:
  - name: nginx-overlay
    image: docker.io/library/nginx:alpine
    resources:
      requests:
        mellanox.com/cx5_sriov_switchdev: '1'
      limits:
        mellanox.com/cx5_sriov_switchdev: '1'
```

- v1.multus-cni.io/default-network: NetworkAttachmentDefinition {namespace}/{name}
- sriov.default.ovn.kubernetes.io/logical\_switch: Pod Pod

## 7.16.5 Underlay

### Kube-OVN

```
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/release-1.15/dist/images/install.sh
```

| IFACE                                  | IP |
|--|----|
| ENABLE_MIRROR=\${ENABLE_MIRROR:-false} |    |
| HW_OFFLOAD=\${HW_OFFLOAD:-true}        |    |
| ENABLE_LB=\${ENABLE_LB:-false}         |    |
| IFACE=""                               |    |
| # Underlay IFACE PF IFACE K8s PF       |    |

### Kube-OVN

```
bash install.sh
```

### VF Pod

yaml VF Pod:

```

apiVersion: kubeovn.io/v1
kind: ProviderNetwork
metadata:
  name: underlay-offload
spec:
  defaultInterface: bond1

---
apiVersion: kubeovn.io/v1
kind: Vlan
metadata:
  name: vlan0
spec:
  id: 0
  provider: underlay-offload

---
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: vlan0
spec:
  protocol: IPv4
  provider: ovn
  cidrBlock: 10.10.204.0/24
  gateway: 10.10.204.254
  vlan: vlan0
  excludeIps:
    - 10.10.204.1..10.10.204.100

---
apiVersion: v1
kind: Pod
metadata:
  name: nginx-underlay
  annotations:
    k8s.v1.cni.cncf.io/networks: '[{
      "name": "sriov",
      "namespace": "default",
      "default-route": ["10.10.204.254"]
    }]'
    ovn.default.ovn.kubernetes.io/logical_switch: vlan0
spec:
  containers:
  - name: nginx-underlay
    image: docker.io/library/nginx:alpine
    resources:
      requests:
        mellanox.com/cx5_sriov_switchdev: '1'
      limits:
        mellanox.com/cx5_sriov_switchdev: '1'

```

• v1.multus-cni.io/default-network: NetworkAttachmentDefinition {namespace}/{name}

|  | multus | VF | Pod | VF | Pod | multus |
|--|--------|----|-----|----|-----|--------|
|--|--------|----|-----|----|-----|--------|

yaml VF Pod:

```

apiVersion: v1
kind: Pod
metadata:
  name: nginx-underlay-noVF
  annotations:
    ovn.kubernetes.io/logical_switch: vlan0
spec:
  containers:
  - name: nginx-underlay-noVF
    image: docker.io/library/nginx:alpine

```

|  | VF | Pod | ovs-kernel | e-switch |
|--|----|-----|------------|----------|
|--|----|-----|------------|----------|

## 7.16.6

Pod ovs-ovn

```

# ovs-appctl dptcl/dump-flows -m type=offloaded
ufid:91cc45de-e7e9-4935-8f82-1890430b0f66, skb_priority(0/0),skb_mark(0/0),ct_state(0/0x23),ct_zone(0/0),ct_mark(0/0),ct_label(0/0x1),recirc_id(0),dp_hash(0/0),in_port(5b45c61b307e_h),packet_type(ns=0/0,id=0/0),eth(src=00:00:00:c5:6d:4e,dst=00:00:00:e7:16:ce),eth_type(0x0800),ipv4(src=0.0.0.0/0.0.0.0,dst=0.0.0.0/0.0.0.0,proto=0/0,tos=0/0,ttl=0/0,frag=no), packets:941539, bytes:62142230, used:0.260s, offloaded:yes, dp:tc, actions:54235e5753b8_h
ufid:e00768d7-e652-4d79-8182-3291d852b791, skb_priority(0/0),skb_mark(0/0),ct_state(0/0x23),ct_zone(0/0),ct_mark(0/0),ct_label(0/0x1),recirc_id(0),dp_hash(0/0),in_port(54235e5753b8_h),packet_type(ns=0/0,id=0/0),eth(src=00:00:00:e7:16:ce,dst=00:00:00:c5:6d:4e),eth_type(0x0800),ipv4(src=0.0.0.0/0.0.0.0,dst=0.0.0/0.0.0.0,proto=0/0,tos=0/0,ttl=0/0,frag=no), packets:82386659, bytes:115944854173, used:0.260s, offloaded:yes, dp:tc, actions:5b45c61b307e_h

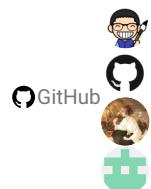
```

offloaded:yes, dp:tc



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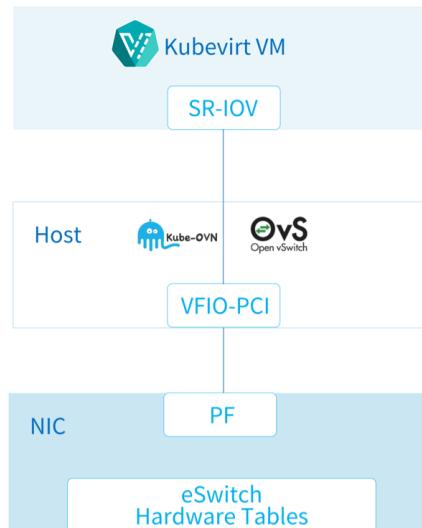


7.16.7

---

## 7.17 Offload

|          |     |     |     |           |     |
|----------|-----|-----|-----|-----------|-----|
| Kube-OVN | OVS | CPU | CPU | Agilio CX | OVS |
| OVS      |     |     |     |           |     |



### Note

2022

### 7.17.1

- Agilio CX
- CentOS 8 Stream    Linux 5.7
- dp\_hash    hash              OVN LB

### 7.17.2 SR-IOV

[Agilio Open vSwitch TC User Guide](#)

```

#!/bin/bash
DEVICE=${1}
DEFAULT_ASSY=scan
ASSY=${2:-$DEFAULT_ASSY}
APP=${3:-flower}

if [ "x${DEVICE}" = "x" -o ! -e /sys/class/net/${DEVICE} ]; then
    echo Syntax: ${0} device [ASSY] [APP]
    echo
    echo This script associates the TC Offload firmware
    echo with a Netronome SmartNIC.
    echo
    echo device: is the network device associated with the SmartNIC

```

```

echo ASSY: defaults to ${DEFAULT_ASSY}
echo APP: defaults to flower. flower-next is supported if updated
echo     firmware has been installed.
exit 1
fi

# It is recommended that the assembly be determined by inspection
# The following code determines the value via the debug interface
if [ "${ASSY}"x = "scanz" ]; then
    ethtool -w ${DEVICE} 0
    DEBUG=$(ethtool -w ${DEVICE} data /dev/stdout | strings)
    SERIAL=$(echo "$DEBUG" | grep '^SN:')
    ASSY=$(echo ${SERIAL} | grep -oE AMDA[0-9]{4})
fi

PCIADDR=$(basename $(readlink -e /sys/class/net/${DEVICE}/device))
FWDIR="/lib/firmware/netronome"

# AMDA0081 and AMDA0097 uses the same firmware
if [ "${ASSY}" = "AMDA0081" ]; then
    if [ ! -e ${FWDIR}/${APP}/nic_AMDA0081.nffw ]; then
        ln -sf nic_AMDA0097.nffw ${FWDIR}/${APP}/nic_AMDA0081.nffw
    fi
fi

FW="${FWDIR}/pci-${PCIADDR}.nffw"
ln -sf "${APP}/nic_${ASSY}.nffw" "${FW}"

# insert distro-specific initramfs section here...

```

```

./agilio-tc-fw-select.sh ens47np0 scan
rmmod nfp
modprobe nfp

```

VF        VF

```

# cat /sys/class/net/ens3/device/sriov_totalvfs
65

# echo 4 > /sys/class/net/ens47/device/sriov_numvfs

```

### 7.17.3 SR-IOV Device Plugin

|    |     |    |                      |
|----|-----|----|----------------------|
| VF | Pod | VF | SR-IOV Device Plugin |
|----|-----|----|----------------------|

SR-IOV Configmap

```

apiVersion: v1
kind: ConfigMap
metadata:
  name: sriovdp-config
  namespace: kube-system
data:
  config.json: |
    {
      "resourceList": [
        {
          "resourcePrefix": "coragine.com",
          "resourceName": "agilio_sriov",
          "selectors": {
            "vendors": ["19ee"],
            "devices": ["6003"],
            "drivers": ["nfp_netvf"]
          }
        }
      ]
    }

```

SR-IOV :

```
kubectl apply -f https://raw.githubusercontent.com/intel/sriov-network-device-plugin/master/deployments/k8s-v1.16/sriovdp-daemonset.yaml
```

SR-IOV        Kubernetes Node

```

kubectl describe no containerserver | grep coragine

coragine.com/agilio_sriov: 4
coragine.com/agilio_sriov: 4
coragine.com/agilio_sriov 0 0

```

## 7.17.4 Multus-CNI

SR-IOV Device Plugin      ID      Multus-CNI      Kube-OVN      Multus-CNI

### Multus-CNI

```
kubectl apply -f https://raw.githubusercontent.com/k8snetworkplumbingwg/multus-cni/master/deployments/multus-daemonset.yaml
```

#### NetworkAttachmentDefinition

```
apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: default
  namespace: default
  annotations:
    k8s.v1.cni.cncf.io/resourceName: coragine.com/agilio_sriov
spec:
  config: '{
    "cniVersion": "0.3.1",
    "name": "kube-ovn",
    "plugins": [
      {
        "type": "kube-ovn",
        "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
        "provider": "default.default.ovn"
      },
      {
        "type": "portmap",
        "capabilities": {
          "portMappings": true
        }
      }
    ]
}'

```

- provider: NetworkAttachmentDefinition {name}.{namespace}.ovn

## 7.17.5 Kube-OVN

```
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/release-1.15/dist/images/install.sh
```

IFACE      IP

```
ENABLE_MIRROR=${ENABLE_MIRROR:-false}
HW_OFFLOAD=${HW_OFFLOAD:-true}
ENABLE_LB=${ENABLE_LB:-false}
IFACE="ensp01"
```

### Kube-OVN

```
bash install.sh
```

## 7.17.6 VF      Pod

yaml      VF      Pod:

```
apiVersion: v1
kind: Pod
metadata:
  name: nginx
  namespace: default
  annotations:
    v1.multus-cni.io/default-network: default/default
spec:
  containers:
    - name: nginx
      image: docker.io/library/nginx:alpine
      resources:
        requests:
          coragine.com/agilio_sriov: '1'
```

```

limits:
  coragine.com/agilio_sriov: '1'

• v1.multus-cni.io/default-network:      NetworkAttachmentDefinition {namespace}/{name}

Pod      ovs-ovn

# ovs-appctl dpctl/dump-flows -m type=offloaded
ufid:91cc45de-e7e9-4935-8f82-1890430b0f66, skb_priority(0/0),skb_mark(0/0),ct_state(0/0x23),ct_zone(0/0),ct_mark(0/0),ct_label(0/0x1),recirc_id(0),dp_hash(0/0),in_port(5b45c61b307e_h),packet_type(ns=0/0,id=0/0),eth(src=00:00:00:c5:6d:4e,dst=00:00:00:e7:16:ce),eth_type(0x0800),ipv4(src=0.0.0.0/0.0.0.0,dst=0.0.0.0/0.0.0.0,proto=0/0,tos=0/0,ttl=0/0,frag=no), packets:941539, bytes:62142230, used:0.260s, offloaded:yes, dp:tc, actions:54235e5753b8_h
ufid:e00768d7-e652-4d79-8182-3291d852b791, skb_priority(0/0),skb_mark(0/0),ct_state(0/0x23),ct_zone(0/0),ct_mark(0/0),ct_label(0/0x1),recirc_id(0),dp_hash(0/0),in_port(54235e5753b8_h),packet_type(ns=0/0,id=0/0),eth(src=00:00:00:e7:16:ce,dst=00:00:00:c5:6d:4e),eth_type(0x0800),ipv4(src=0.0.0.0/0.0.0.0,dst=0.0.0.0/0.0.0.0,proto=0/0,tos=0/0,ttl=0/0,frag=no), packets:82386659, bytes:115944854173, used:0.260s, offloaded:yes, dp:tc, actions:5b45c61b307e_h

offloaded:yes, dp:tc

```

[PDF](#)[Slack](#)[Support](#)

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[GitHub](#)

7.17.7

## 7.18 Offload



### Note

1. 2024
2. 1.11 Kube-OVN

### 7.18.1

- metaScale
- MCR
- BIOS SR-IOV VT-d

### 7.18.2

#### **hw-offload    Kube-OVN**

1.

```
wget https://github.com/yunsilicon/kube-ovn/blob/release-1.11/dist/images/install.sh
```

1.

```
/opt/ovs-config/ovs-dpdk-config
```

```
# specify log level for ovs dpdk, the value is info or dbg, default is info
VLOG=info
# specify nic offload, the value is true or false, default is true
HW_OFFLOAD=true
# specify cpu mask for ovs dpdk, not specified by default
CPU_MASK=0x02
# specify socket memory, not specified by default
SOCKET_MEM="2048,2048"
# specify encap IP
ENCAP_IP=6.6.208/24
# specify pci device
DPDK_DEV=0000:b3:00.0
# specify mtu, default is 1500
PF_MTU=1500
# specify bond name if bond enabled, not specified by default
BR_PHY_BOND_NAME=bond0
```

1. Kube-OVN

```
bash install.sh
```

#### **SR-IOV**

1. metaScale    ID    b3:00.0:

```
[root@k8s-master ~]# lspci -d 1f67:
b3:00.0 Ethernet controller: Device 1f67:1111 (rev 02)
b3:00.1 Ethernet controller: Device 1f67:1111 (rev 02)
```

1. ID    p3p1

```
ls -l /sys/class/net/ | grep b3:00.0
lrwxrwxrwx 1 root root 0 May 7 16:30 p3p1 -> ../../devices/pci0000:b2/0000:b2:00.0/0000:b3:00.0/net/p3p1
```

## 1. VF

```
cat /sys/class/net/p3p1/device/sriov_totalvfs
512
```

## 1. VF

```
echo '10' > /sys/class/net/p3p1/device/sriov_numvfs
```

## 1. VF

```
lspci -d 1f67:
b3:00.0 Ethernet controller: Device 1f67:1111 (rev 02)
b3:00.1 Ethernet controller: Device 1f67:1111 (rev 02)
b3:00.2 Ethernet controller: Device 1f67:1112
b3:00.3 Ethernet controller: Device 1f67:1112
b3:00.4 Ethernet controller: Device 1f67:1112
b3:00.5 Ethernet controller: Device 1f67:1112
b3:00.6 Ethernet controller: Device 1f67:1112
b3:00.7 Ethernet controller: Device 1f67:1112
b3:01.0 Ethernet controller: Device 1f67:1112
b3:01.1 Ethernet controller: Device 1f67:1112
b3:01.2 Ethernet controller: Device 1f67:1112
b3:01.3 Ethernet controller: Device 1f67:1112
```

## 1. switchdev

```
devlink dev eswitch set pci/0000:b3:00.0 mode switchdev
```

## SR-IOV Device Plugin

### 1. SR-IOV ConfigMap

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: sriovdp-config
  namespace: kube-system
data:
  config.json: |
    {
      "resourceList": [
        {
          "resourceName": "xsc_sriov",
          "resourcePrefix": "yunsilicon.com",
          "selectors": {
            "vendors": ["1f67"],
            "devices": ["1012", "1112"]
          }
        }
      ]
    }
```

### 1. SR-IOV Device Plugin DevicePlugin

### 2. SR-IOV

```
# kubectl describe node <node name> | grep yunsilicon.com/xsc_sriov
yunsilicon.com/xsc_sriov: 10
yunsilicon.com/xsc_sriov: 10
yunsilicon.com/xsc_sriov 0 0
```

## Multus-CNI

### 1. Multus-CNI Multus-CNI

```
kubectl apply -f https://raw.githubusercontent.com/k8snetworkplumbingwg/multus-cni/master/deployments/multus-daemonset.yaml
```

### 1. NetworkAttachmentDefinition

```
apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
```

```

metadata:
  name: sriov-net1
  namespace: default
  annotations:
    k8s.v1.cncf.io/resourceName: yunsilicon.com/xsc_sriov
spec:
  config: '{
    "cniVersion": "0.3.1",
    "name": "kube-ovn",
    "plugins": [
      {
        "type": "kube-ovn",
        "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
        "provider": "sriov-net1.default.ovn"
      },
      {
        "type": "portmap",
        "capabilities": {
          "portMappings": true
        }
      }
    ]
}'

```

## SR-IOV Pod

```

apiVersion: v1
kind: Pod
metadata:
  name: nginx
  annotations:
    v1.multus-cni.io/default-network: default/sriov-net1
spec:
  containers:
    - name: nginx
      image: docker.io/library/nginx:alpine
      resources:
        requests:
          yunsilicon.com/xsc_sriov: '1'
        limits:
          yunsilicon.com/xsc_sriov: '1'

```

## Offload

Pod ovs-ovn

```

ovs-appctl dptcl/dump-flows type=offloaded
flow-dump from pmd on cpu core: 9
ct_state(-new+est-rel+rpl+trk),ct_mark(0/0x3),recirc_id(0x2d277),in_port(15),packet_type(ns=0,id=0),eth(src=00:00:00:9d:fb:1a,dst=00:00:ce:cf:b9),eth_type(0x0800),ipv4(dst=10.16.0.14,frag=no),packets:6,bytes:588,used:7.276s,actions:ct(zone=4,nat),recirc(0x2d278)
ct_state(-new+est-rel+rpl+trk),ct_mark(0/0x3),recirc_id(0x2d275),in_port(8),packet_type(ns=0,id=0),eth(src=00:00:00:ce:cf:b9,dst=00:00:00:9d:fb:1a),eth_type(0x0800),ipv4(dst=10.16.0.18,frag=no),packets:5,bytes:490,used:7.434s,actions:ct(zone=6,nat),recirc(0x2d276)
ct_state(-new+est-rel-rpl+trk),ct_mark(0/0x1),recirc_id(0x2d276),in_port(8),packet_type(ns=0,id=0),eth(src=00:00:00:ce:cf:b9,dst=00:00:00:9d:fb:1a),eth_type(0x0800),eth_type(0x0800),ipv4(dst=10.16.0.18/255.192.0.0,frag=no),packets:6,bytes:588,used:7.277s,actions:ct(zone=6,nat),recirc(0x2d277)
recirc_id(0),in_port(15),packet_type(ns=0,id=0),eth(src=00:00:00:9d:fb:1a/01:00:00:00:00:00,dst=00:00:00:ce:cf:b9),eth_type(0x0800),ipv4(dst=10.16.0.18/255.192.0.0,frag=no),packets:6,bytes:588,used:7.434s,actions:ct(zone=4,nat),recirc(0x2d275)
ct_state(-new+est-rel+rpl+trk),ct_mark(0/0x1),recirc_id(0x2d278),in_port(15),packet_type(ns=0,id=0),eth(dst=00:00:00:ce:cf:b9/01:00:00:00:00:00),eth_type(0x0800),ipv4(frag=no),packets:6,bytes:588,used:7.277s,actions:8

```

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7.18.3

## 7.19 Offload



### Note

2024

### 7.19.1

- 2200E
- HADOS
- BIOS SR-IOV

### 7.19.2

#### SR-IOV

1. 2200E vendor ID 1f47 ID 00:0a.0 00:0b.0 2200E

```
lspci | grep 1f47
00:0a.0 Ethernet controller: Device 1f47:1001 (rev 10)
00:0b.0 Ethernet controller: Device 1f47:1001 (rev 10)
```

1. VF

```
cat /sys/bus/pci/devices/0000\:00\:0a.0/sriov_totalvfs
256
```

1. VF VF

```
echo 7 > /sys/bus/pci/devices/0000\:00\:0a.0/sriov_numvfs
```

1. VF

```
lspci | grep 1f47
00:0a.0 Ethernet controller: Device 1f47:1001 (rev 10)
00:0a.1 Ethernet controller: Device 1f47:110f (rev 10)
00:0a.2 Ethernet controller: Device 1f47:110f (rev 10)
00:0a.3 Ethernet controller: Device 1f47:110f (rev 10)
00:0a.4 Ethernet controller: Device 1f47:110f (rev 10)
00:0a.5 Ethernet controller: Device 1f47:110f (rev 10)
00:0a.6 Ethernet controller: Device 1f47:110f (rev 10)
00:0a.7 Ethernet controller: Device 1f47:110f (rev 10)
00:0b.0 Ethernet controller: Device 1f47:1001 (rev 10)
```

#### SR-IOV Device Plugin

1. SR-IOV Configmap SR-IOV Device Plugin VF Pod

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: sriovdp-config
  namespace: kube-system
data:
  config.json: |
    {
      "resourceList": [
        {
          "resourceName": "sriov_dpu",
          "resourcePrefix": "yusur.tech",
          "selectors": {
            "vendors": ["1f47"],
            "devices": ["110f"]
          }
        }
      ]
    }
```

```
    ]  
}
```

## 1. SR-IOV Device Plugin

```
kubectl apply -f https://raw.githubusercontent.com/k8snetworkplumbingwg/sriov-network-device-plugin/v3.6.2/deployments/sriovdp-daemonset.yaml
```

### 1. SR-IOV      kubernetes Node

```
kubectl describe node node1 | grep yusur  
yusur.tech/sriov_dpu: 7  
yusur.tech/sriov_dpu: 7  
yusur.tech/sriov_dpu 0 0
```

## 7.19.3 Multus-CNI

Multus-CNI    Kube-OCN    SRIOV    Device ID

```
kubectl apply -f https://raw.githubusercontent.com/k8snetworkplumbingwg/multus-cni/v4.0.2/deployments/multus-daemonset-thick.yaml
```

### NetworkAttachmentDefinition

```
apiVersion: "k8s.cni.cncf.io/v1"  
kind: NetworkAttachmentDefinition  
metadata:  
  name: test  
  namespace: kube-system  
  annotations:  
    k8s.v1.cni.cncf.io/resourceName: yusur.tech/sriov_dpu  
spec:  
  config: '{  
    "cniVersion": "0.3.1",  
    "name": "kube-ovn",  
    "plugins": [  
      {  
        "type": "kube-ovn",  
        "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",  
        "provider": "test.kube-system.ovn"  
      },  
      {  
        "type": "portmap",  
        "capabilities": {  
          "portMappings": true  
        }  
      }  
    ]  
  }
```

- provider : NetworkAttachmentDefinition {name}. {namespace}. ovn

## 7.19.4 Kube-OVN

### 1.

```
wget https://github.com/kubeovn/kube-ovn/blob/release-1.12/dist/images/install.sh
```

### 1. IFACE      IP

```
ENABLE_MIRROR=${ENABLE_MIRROR:-false}  
HW_OFFLOAD=${HW_OFFLOAD:-true}  
ENABLE_LB=${ENABLE_LB:-false}  
IFACE="p0"
```

### 1. kube-ovn

```
bash install.sh
```

### VF    pod

yaml    VF    Pod

```

apiVersion: v1
kind: Pod
metadata:
  name: nginx
  namespace: default
  annotations:
    v1.multus-cni.io/default-network: kube-system/test
spec:
  containers:
    - name: nginx
      image: docker.io/library/nginx:alpine
      resources:
        requests:
          yusur.tech/sriov_dpu: '1'
        limits:
          yusur.tech/sriov_dpu: '1'

```

- v1.multus-cni.io/default-network : NetworkAttachmentDefinition {namespace}/{name}

## Offload

Pod ovs-ovn

```

# ovs-appctl dpctl/dump-flows -m type=offloaded
ufid:67c2e10f-92d4-4574-be70-d072815ff166, skb_priority(0/0),skb_mark(0/0),ct_state(0/0x23),ct_zone(0/0),ct_mark(0/0),ct_label(0/0),recirc_id(0),dp_hash(0/0),in_port(d85b161b6840_h),packet_type(ns=0/0,id=0/0),eth(src=0a:c9:1c:70:01:09,dst=8a:18:a4:22:b7:7d),eth_type(0x0800),ipv4(src=10.0.1.10,dst=10.0.1.6,proto=6,tos=0/0x3,ttl=0/0,frag=no),tcp(src=60774,dst=9001),packets:75021,bytes:109521630,offload_packets:75019,offload_bytes:109521498,used:3.990s,offloaded:yes,dp:tc,actions:set(tunnel(tun_id=0x5,dst=192.168.201.12,ttl=64,tp_dst=6081,geneve({class=0x102,type=0x80,len=4,0xa0006}),flags(csum(key))),genev_sys_6081
ufid:7940666e-a0bd-42a5-8116-1e84e81bb338, skb_priority(0/0),tunnel(tun_id=0x5,src=192.168.201.12,dst=192.168.201.11,ttl=0/0,tp_dst=6081,geneve({class=0x102,type=0x80,len=4,0x6000a}),flags(+key)),skb_mark(0/0),ct_state(0/0),ct_zone(0/0),ct_mark(0/0),ct_label(0/0),recirc_id(0),dp_hash(0/0),in_port(genev_sys_6081),packet_type(ns=0/0,id=0/0),eth(src=8a:18:a4:22:b7:7d,dst=0a:c9:1c:70:01:09),eth_type(0x0800),ipv4(src=10.0.1.6,dst=10.0.1.10,proto=6,tos=0/0,ttl=0/0,frag=no),tcp(src=9001,dst=60774),packets:6946,bytes:459664,offload_packets:6944,offload_bytes:459532,used:4.170s,dp:tc,offloaded:yes,actions:d85b161b6840_h

```



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7.19.5

7.20 DPDK

## Kube-OVN      OVS-DPDK      KubeVirt      DPDK

KubeVirt OVS-DPDK patchVhostuser implementation KubeVirt KVM Device Plugin OVS-DPDK

## 7.20.1

- DPDK
  - Hugepages

## 7.20.2 DPDK

`driverctl` DPDK

```
driverctl set-override 0000:00:0b.0 uio_pci_generic
```

7.20.3

```
kubectl label nodes <node> ovn.kubernetes.io/ovs_dp_type="userspace"
```

OVS-DPDK /opt/ovs-config ovs-dpdk-config

ENCAP\_IP=192.168.122.193/24  
DPDK\_DEV=0000:00:0b.0

- ENCAP\_IP :
  - DPDK\_DEV : PCI ID

## 7.20.4 Kube-OVN

```
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/release-1.15/dist/images/install.sh
```

DPDK

```
bash install.sh --with-hybrid-dpdk
```

## 7.20.5

vhostuser OVS-DPDK

KVM Device Plugin KVM Device Plugin

```
kubectl apply -f https://raw.githubusercontent.com/kubevirt/kubernetes-device-plugins/master/manifests/kvm-ds.yaml
```

## NetworkAttachmentDefinition

```
apiVersion: k8s.cni.cncf.io/v1
kind: NetworkAttachmentDefinition
metadata:
  name: ovn-dpdk
  namespace: default
spec:
  config: >-
    {
      "cniVersion": "0.3.0",
      "tvsne": "kube-ovn"
```

```

        "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
        "provider": "ovn-dpdk.default.ovn",
        "vhost_user_socket_volume_name": "vhostuser-sockets",
        "vhost_user_socket_name": "sock"
    }
}
```

## Dockerfile VM

```

FROM quay.io/kubenvirt/virt-launcher:v0.46.1

# wget http://cloud.centos.org/centos/7/images/CentOS-7-x86_64-GenericCloud.qcow2
COPY CentOS-7-x86_64-GenericCloud.qcow2 /var/lib/libvirt/images/CentOS-7-x86_64-GenericCloud.qcow2

```

```

apiVersion: v1
kind: ConfigMap
metadata:
  name: vm-config
data:
  start.sh: |
    chmod u+w /etc/libvirt/qemu.conf
    echo "hugepages_mount = \"/dev/hugepages\" >> /etc/libvirt/qemu.conf
    virtlogd &
    libvirtd &

    mkdir /var/lock

    sleep 5

    virsh define /root/vm/vm.xml
    virsh start vm

    tail -f /dev/null
  vm.xml: |
    <domain type='kvm'>
      <name>vm</name>
      <uuid>4a9b3f53-fa2a-47f3-a757-dd87720d9d1d</uuid>
      <memory unit='KiB'>2097152</memory>
      <currentMemory unit='KiB'>2097152</currentMemory>
      <memoryBacking>
        <hugepages>
          <page size='2' unit='M' nodeset='0' />
        </hugepages>
      </memoryBacking>
      <vcpu placement='static'>2</vcpu>
      <cpurtune>
        <shares>4096</shares>
        <vcpu pin vcpu='0' cpuset='4' />
        <vcpu pin vcpu='1' cpuset='5' />
        <emulatorpin cpuset='1,3' />
      </cpurtune>
      <os>
        <type arch='x86_64' machine='pc'>hvm</type>
        <boot dev='hd' />
      </os>
      <features>
        <acpi/>
        <apic/>
      </features>
      <cpu mode='host-model'>
        <model fallback='allow' />
        <topology sockets='1' cores='2' threads='1' />
        <numa>
          <cell id='0' cpus='0-1' memory='2097152' unit='KiB' memAccess='shared' />
        </numa>
      </cpu>
      <on_reboot>restart</on_reboot>
      <devices>
        <emulator>/usr/libexec/qemu-kvm</emulator>
        <disk type='file' device='disk'>
          <driver name='qemu' type='qcow2' cache='none' />
          <source file='/var/lib/libvirt/images/CentOS-7-x86_64-GenericCloud.qcow2' />
          <target dev='vda' bus='virtio' />
        </disk>
        <interface type='vhostuser'>
          <mac address='00:00:00:0A:30:89' />
          <source type='unix' path='/var/run/vm.sock' mode='server' />
          <model type='virtio' />
          <driver queues='2'>
            <host mrg_rxbuf='off' />
          </driver>
        </interface>
        <serial type='pty'>
          <target type='isa-serial' port='0'>
            <model name='isa-serial' />
          </target>
        </serial>
        <console type='pty'>
          <target type='serial' port='0' />
        </console>
      </devices>
    </domain>

```

```

</console>
<channel type='unix'>
  <source mode='bind' path='/var/lib/libvirt/qemu/channel/target/domain-1-vm/org.qemu.guest_agent.0' />
  <target type='virtio' name='org.qemu.guest_agent.0' state='connected' />
  <alias name='channel0' />
</channel>

</devices>
</domain>
---
apiVersion: apps/v1
kind: Deployment
metadata:
  name: vm-deployment
  labels:
    app: vm
spec:
  replicas: 1
  selector:
    matchLabels:
      app: vm
  template:
    metadata:
      labels:
        app: vm
      annotations:
        k8s.v1.cni.cncf.io/networks: default/ovn-dpdk
        ovn-dpdk.default.ovn.kubernetes.io/ip_address: 10.16.0.96
        ovn-dpdk.default.ovn.kubernetes.io/mac_address: 00:00:00:0A:30:89
  spec:
    nodeSelector:
      ovn.kubernetes.io/ovs_dp_type: userspace
    securityContext:
      runAsUser: 0
    volumes:
      - name: vhostuser-sockets
        emptyDir: {}
      - name: xml
        configMap:
          name: vm-config
      - name: hugepage
        emptyDir:
          medium: HugePages-2Mi
      - name: libvirt-runtime
        emptyDir: {}
    containers:
      - name: vm
        image: vm-vhostuser:latest
        command: ["bash", "/root/vm/start.sh"]
        securityContext:
          capabilities:
            add:
              - NET_BIND_SERVICE
              - SYS_NICE
              - NET_RAW
              - NET_ADMIN
        privileged: false
        runAsUser: 0
        resources:
          limits:
            cpu: '2'
            devices.kubevirt.io/kvm: '1'
            memory: '8784969729'
            hugepages-2Mi: 2Gi
          requests:
            cpu: 666m
            devices.kubevirt.io/kvm: '1'
            ephemeral-storage: 50M
            memory: '4490002433'
        volumeMounts:
          - name: vhostuser-sockets
            mountPath: /var/run/vm
          - name: xml
            mountPath: /root/vm/
          - mountPath: /dev/hugepages
            name: hugepage
          - name: libvirt-runtime
            mountPath: /var/run/libvirt

```

## Pod

```

# virsh set-user-password vm root 12345
Password set successfully for root in vm

# virsh console vm
Connected to domain 'vm'
Escape character is ^] (Ctrl + ])

CentOS Linux 7 (Core)
Kernel 3.10.0-1127.el7.x86_64 on an x86_64

```

```
localhost login: root
Password:
Last login: Fri Feb 25 09:52:54 on ttys0
```

```
ip link set eth0 mtu 1400
ip addr add 10.16.0.96/16 dev eth0
ip ro add default via 10.16.0.1
ping 114.114.114.114
```

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7.20.6

## 7.21 OpenStack



### 7.21.1

OVN-IC      Kubernetes      OpenStack    Kubernetes

1.      OpenStack    Kubernetes      CIDR
- 2.
3.      IP
4.      Kubernetes      OpenStack      VPC

#### OVN-IC

OVN-IC

```
docker run --name=ovn-ic-db -d --network=host -v /etc/ovn/:/etc/ovn -v /var/run/ovn:/var/run/ovn -v /var/log/ovn:/var/log/ovn kubeovn/kube-ovn:v1.15.0 bash start-ic-db.sh
```

#### Kubernetes

kube-system Namespace      ovn-ic-config ConfigMap

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: ovn-ic-config
  namespace: kube-system
data:
  enable-ic: "true"
  az-name: "az1"
  ic-db-host: "192.168.65.3"
  ic-nb-port: "6645"
  ic-sb-port: "6646"
  gw-nodes: "az1-gw"
  auto-route: "true"
```

- enable-ic:
- az-name:
- ic-db-host:      OVN-IC
- ic-nb-port:      6645
- ic-sb-port:      OVN-IC      6646
- gw-nodes:
- auto-route:

#### OpenStack

Kubernetes

```
# openstack router create router0
# openstack router list
+-----+-----+-----+-----+
| ID      | Name   | Status | State | Project |
+-----+-----+-----+-----+
| d5b38655-249a-4192-8046-71aa4d2b4af1 | router0 | ACTIVE | UP    | 98a29ab7388347e7b5ff8bdd181ba4f9 |
+-----+-----+-----+-----+
```

## OpenStack OVN

```
ovn-nbctl set NB_Global . name=op-az
```

OVN-IC      OVN-IC

```
/usr/share/ovn/scripts/ovn-ctl --ovn-ic-nb-db=tcp:192.168.65.3:6645 \
--ovn-ic-sb-db=tcp:192.168.65.3:6646 \
--ovn-northd-nb-db=unix:/run/ovnnb_db.sock \
--ovn-northd-sb-db=unix:/run/ovn/ovnsb_db.sock \
start_ic
```

- ovn-ic-nb-db ovn-ic-sb-db : OVN-IC
- ovn-northd-nb-db ovn-northd-sb-db : OVN

```
ovs-vsctl set open_vswitch . external_ids:ovn-is-interconn=true
```

## OpenStack OVN

ts      router0

```
ovn-nbctl lrp-add router0 lrp-router0-ts 00:02:ef:11:39:4f 169.254.100.73/24
ovn-nbctl lsp-add ts lsp-ts-router0 -- lsp-set-addresses lsp-ts-router0 router \
-- lsp-set-type lsp-ts-router0 router \
-- lsp-set-options lsp-ts-router0 router-port=lrp-router0-ts
ovn-nbctl lrp-set-gateway-chassis lrp-router0-ts {gateway chassis} 1000
ovn-nbctl set NB_Global . options:ic-route-adv=true options:ic-route-learn=true
```

## Kubernetes

```
# ovn-nbctl lr-route-list router0
IPv4 Routes
      10.0.0.22          169.254.100.34 dst-ip (learned)
      10.16.0.0/16        169.254.100.34 dst-ip (learned)
```

router0      Kubernetes Pod

## 7.21.2 OVN

OpenStack   Kubernetes      OVN      VPC   Subnet

Kube-OVN   OVN   OpenStack   Neutron      OVN      OpenStack   networking-ovn   Neutron

### Neutron

Neutron      /etc/neutron/plugins/ml2/ml2\_conf.ini

```
[ovn]
...
ovn_nb_connection = tcp:[192.168.137.176]:6641,tcp:[192.168.137.177]:6641,tcp:[192.168.137.178]:6641
ovn_sb_connection = tcp:[192.168.137.176]:6642,tcp:[192.168.137.177]:6642,tcp:[192.168.137.178]:6642
ovn_l3_scheduler = OVN_L3_SCHEDULER
```

- ovn\_nb\_connection ovn\_sb\_connection : Kube-OVN ovn-central

### OVS

```
ovs-vsctl set open . external_ids:ovn-remote=tcp:[192.168.137.176]:6642,tcp:[192.168.137.177]:6642,tcp:[192.168.137.178]:6642
ovs-vsctl set open . external_ids:ovn-encap-type=geneve
ovs-vsctl set open . external_ids:ovn-encap-ip=192.168.137.200
```

- external-ids:ovn-remote : Kube-OVN ovn-central
- ovn-encap-ip : IP

## Kubernetes OpenStack

Kubernetes    OpenStack    OpenStack    Pod



kube-ovn-controller args --enable-external-vpc=true

## OpenStack

```
# openstack router list
+-----+-----+-----+
| ID      | Name   | Status | State | Project |
+-----+-----+-----+
| 22040ed5-0598-4f77-bffd-e7fd4db47e93 | router0 | ACTIVE | UP    | 62381a21d569404aa236a5d8712449c |
+-----+-----+-----+
# openstack network list
+-----+-----+
| ID      | Name   | Subnets |
+-----+-----+
| cd59e36a-37db-4c27-b709-d35379a7920f | provider | 01d73d9f-fdaa-426c-9b60-aa34abbfaeae |
+-----+-----+
# openstack subnet list
+-----+-----+-----+
| ID      | Name       | Network          | Subnet |
+-----+-----+-----+
| 01d73d9f-fdaa-426c-9b60-aa34abbfaeae | provider-v4 | cd59e36a-37db-4c27-b709-d35379a7920f | 192.168.1.0/24 |
+-----+-----+-----+
# openstack server list
+-----+-----+-----+-----+-----+
| ID      | Name       | Status | Networks | Image | Flavor |
+-----+-----+-----+-----+-----+
| 8433d622-a8d6-41a7-8b31-49abfd64f639 | provider-instance | ACTIVE | provider=192.168.1.61 | ubuntu | m1 |
+-----+-----+-----+-----+-----+
```

## Kubernetes VPC

```
# kubectl get vpc
NAME           STANDBY   SUBNETS
neutron-22040ed5-0598-4f77-bffd-e7fd4db47e93  true      ["neutron-cd59e36a-37db-4c27-b709-d35379a7920f"]
ovn-cluster     true      ["join", "ovn-default"]
```

neutron-22040ed5-0598-4f77-bffd-e7fd4db47e93    OpenStack    VPC

Kube-OVN    VPC    Subnet    Pod

VPC, Subnet    Namespace net2    Pod:

```
apiVersion: v1
kind: Namespace
metadata:
  name: net2
---
apiVersion: kubeovn.io/v1
kind: Vpc
metadata:
  creationTimestamp: "2021-06-20T13:34:11Z"
  generation: 2
  labels:
    ovn.kubernetes.io/vpc_external: "true"
  name: neutron-22040ed5-0598-4f77-bffd-e7fd4db47e93
  resourceVersion: "583728"
  uid: 18d4c654-f511-4def-a3a0-a6434d237c1e
spec:
  namespaces:
    - net2
---
kind: Subnet
apiVersion: kubeovn.io/v1
metadata:
  name: net2
spec:
  vpc: neutron-22040ed5-0598-4f77-bffd-e7fd4db47e93
  namespaces:
    - net2
  cidrBlock: 12.0.1.0/24
  natOutgoing: false
---
apiVersion: v1
kind: Pod
metadata:
  name: ubuntu
```

```
namespace: net2
spec:
  containers:
    - image: docker.io/kubeovn/kube-ovn:v1.8.0
      command:
        - "sleep"
        - "604800"
      imagePullPolicy: IfNotPresent
      name: ubuntu
      restartPolicy: Always
```

[!\[\]\(773dfc1e6ac8a737b4d54f29104526a7\_img.jpg\) PDF](#)[!\[\]\(7a2589c4a695b8556972f11ee43a3628\_img.jpg\) Slack](#)[!\[\]\(04ec4af47111f16bbe5b5fc43d36f80f\_img.jpg\) Support](#)

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7.21.3

---

## 7.22 IPsec

v1.13.0      UDP 500 4500

### 7.22.1

```
kube-ovn-cni certificatesigningrequest kube-ovn-controller kube-ovn-controller approve kube-ovn-cni ipsec  
ipsec
```

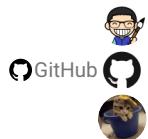
### 7.22.2 IPsec

```
kube-ovn-controller kube-ovn-cni args --enable-ovn-ipsec=false --enable-ovn-ipsec=true
```



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### 7.22.3

## 7.23 OVN

|     |            |       |
|-----|------------|-------|
| Pod | GRE/ERSPAN |       |
|     | Kube-OVN   | v1.12 |

### 7.23.1 Multus-CNI

Multus-CNI      Multus

### 7.23.2

```
apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
  name: attachnet
  namespace: default
spec:
  config: |
    {
      "cniVersion": "0.3.1",
      "type": "kube-ovn",
      "server_socket": "/run/openvswitch/kube-ovn-daemon.sock",
      "provider": "attachnet.default.ovn"
    }
}
```

provider <NAME>.<NAMESPACE>.ovn

### 7.23.3 Underlay

MTU      LSP/Pod      Underlay

Underlay

```
apiVersion: kubeovn.io/v1
kind: ProviderNetwork
metadata:
  name: net1
spec:
  defaultInterface: eth1
---
apiVersion: kubeovn.io/v1
kind: Vlan
metadata:
  name: vlan1
spec:
  id: 0
  provider: net1
---
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: subnet1
spec:
  protocol: IPv4
  cidrBlock: 172.19.0.0/16
  excludeIps:
  - 172.19.0.2..172.19.0.20
  gateway: 172.19.0.1
  vlan: vlan1
  provider: attachnet.default.ovn
```

provider      provider

### 7.23.4 Pod

Pod

```
apiVersion: v1
kind: Pod
```

```

metadata:
  name: pod1
  annotations:
    k8s.v1.cni.cncf.io/networks: default/attachnet
spec:
  containers:
  - name: bash
    image: docker.io/kubeovn/kube-ovn:v1.15.0
    args:
    - bash
    - -c
    - sleep infinity
    securityContext:
      privileged: true

```

#### Pod IP

```
$ kubectl get ips | grep pod1
pod1.default          10.16.0.12  00:00:00:FF:34:24  kube-ovn-worker  ovn-default
pod1.default.attachnet.default.ovn  172.19.0.21  00:00:00:A0:30:68  kube-ovn-worker  subnet1
```

IP 172.19.0.21

### 7.23.5 OVN

#### OVN

```
kubectl ko nbctl mirror-add mirror1 gre 99 from-lport 172.19.0.21
kubectl ko nbctl lsp-attach-mirror coredns-787d4945fb-gpnkb.kube-system mirror1
```

coredns-787d4945fb-gpnkb.kube-system OVN LSP <POD\_NAME>.<POD\_NAMESPACE>

#### OVN

```
ovn-nbctl mirror-add <NAME> <TYPE> <INDEX> <FILTER> <IP>

NAME  - add a mirror with given name
TYPE  - specify TYPE 'gre' or 'erspan'
INDEX - specify the tunnel INDEX value
        (indicates key if GRE, erSPAN_idx if ERSPAN)
FILTER - specify FILTER for mirroring selection
        ('to-lport' / 'from-lport')
IP    - specify Sink / Destination i.e. Remote IP

ovn-nbctl mirror-del [NAME]      remove mirrors
ovn-nbctl mirror-list           print mirrors

ovn-nbctl lsp-attach-mirror PORT MIRROR  attach source PORT to MIRROR
ovn-nbctl lsp-detach-mirror PORT MIRROR  detach source PORT from MIRROR
```

### 7.23.6 Pod

#### Pod

```
root@pod1:/kube-ovn# ip link add mirror1 type gretap local 172.19.0.21 key 99 dev net1
root@pod1:/kube-ovn# ip link set mirror1 up
```

#### Pod

```
root@pod1:/kube-ovn# tcpdump -i mirror1 -nnve
tcpdump: listening on mirror1, link-type EN10MB (Ethernet), snapshot length 262144 bytes
05:13:30.328800 00:00:00:a3:f5:e2 > 00:00:00:97:0f:6e, ethertype ARP (0x0806), length 42: Ethernet (len 6), IPv4 (len 4), Request who-has 10.16.0.7 tell 10.16.0.4, length 28
05:13:30.559167 00:00:00:a3:f5:e2 > 00:00:00:89:d5:cc, ethertype IPv4 (0x0800), length 212: (tos 0x0, ttl 64, id 57364, offset 0, flags [DF], proto UDP (17), length 198)
  10.16.0.4.53 > 10.16.0.6.50472: 34511 NXDomain*- 0/1/1 (170)
05:13:30.560625 00:00:00:a3:f5:e2 > 00:00:00:89:d5:cc, ethertype IPv4 (0x0800), length 212: (tos 0x0, ttl 64, id 57365, offset 0, flags [DF], proto UDP (17), length 198)
  10.16.0.4.53 > 10.16.0.6.45177: 1659 NXDomain*- 0/1/1 (170)
05:13:30.562774 00:00:00:a3:f5:e2 > 00:00:00:89:d5:cc, ethertype IPv4 (0x0800), length 191: (tos 0x0, ttl 64, id 57368, offset 0, flags [DF], proto UDP (17), length 177)
  10.16.0.4.53 > 10.16.0.6.37755: 48737 NXDomain*- 0/1/1 (149)
05:13:30.563523 00:00:00:a3:f5:e2 > 00:00:00:89:d5:cc, ethertype IPv4 (0x0800), length 187: (tos 0x0, ttl 64, id 57369, offset 0, flags [DF], proto UDP (17), length 173)
  10.16.0.4.53 > 10.16.0.6.53887: 45519 NXDomain*- 0/1/1 (145)
05:13:30.564940 00:00:00:a3:f5:e2 > 00:00:00:89:d5:cc, ethertype IPv4 (0x0800), length 201: (tos 0x0, ttl 64, id 57370, offset 0, flags [DF], proto UDP (17),
```

```

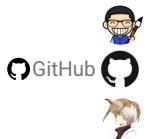
length 187)
 10.16.0.4.53 > 10.16.0.6.40846: 25745 NXDomain*- 0/1/1 (159)
05:13:30.565140 00:00:00:a3:f5:e2 > 00:00:00:89:d5:cc, ethertype IPv4 (0x0800), length 201: (tos 0x0, ttl 64, id 57371, offset 0, flags [DF], proto UDP (17),
length 187)
 10.16.0.4.53 > 10.16.0.6.45214: 61875 NXDomain*- 0/1/1 (159)
05:13:30.566023 00:00:00:a3:f5:e2 > 00:00:00:55:e4:4e, ethertype IPv4 (0x0800), length 80: (tos 0x0, ttl 64, id 45937, offset 0, flags [DF], proto UDP (17),
length 66)
 10.16.0.4.44116 > 172.18.0.1.53: 16025+ [1au] AAAA? kube-ovn.io. (38)

```

## 7.23.7

|    |        |     |       |      |        |      |       |      |
|----|--------|-----|-------|------|--------|------|-------|------|
| 1. | ERSPAN | OVN | Linux | 4.14 | ERSPAN | IPv6 | Linux | 4.16 |
| 2. |        | OVN |       |      |        |      |       |      |

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## 7.23.8

## 7.24 DNS Kube-OVN

NodeLocal DNSCache      DaemonSet      DNS      DNS      Kube-OVN

### 7.24.1 DNS

Kubernetes      DNS

Kubernetes      Nodelocaldnscache

```
#!/bin/bash

localdns=169.254.20.10
domain=cluster.local
kubedns=10.96.0.10

wget https://raw.githubusercontent.com/kubernetes/kubernetes/master/cluster/addons/dns/nodelocaldns/nodelocaldns.yaml
sed -i "s/_PILLAR__LOCAL__DNS__/$localdns/g; s/_PILLAR__DNS__DOMAIN__/$domain/g; s/_PILLAR__DNS__SERVER__//g; s/_PILLAR__CLUSTER__DNS__/$kubedns/g"
nodelocaldns.yaml

kubectl apply -f nodelocaldns.yaml
```

kubelet      /var/lib/kubelet/config.yaml      clusterDNS      DNS IP 169.254.20.10      kubelet

### Kube-OVN DNS

Kubernetes Nodelocal DNScache      Kube-OVN

UNDERLAY SUBNET      U20

Underlay Subnet      DNS      U20      kubectl edit subnet {your subnet}      spec.u2oInterconnection = true ,      Overlay Subnet

KUBE-OVN-CONTROLLER      DNS IP

```
kubectl edit deployment kube-ovn-controller -n kube-system

spec.template.spec.containers.args      --node-local-dns-ip=169.254.20.10
```

POD

Pod      /etc/resolv.conf      nameserver      DNS IP      Pod      nameserver      DNS ClusterIP      u2o      Pod      Pod

## 7.24.2 DNS

Pod      Pod      DNS      169.254.20.10

```
# kubectl exec -it pod1 -- nslookup github.com
Server: 169.254.20.10
Address: 169.254.20.10:53

Name:   github.com
Address: 20.205.243.166
```

DNS      ovn0      DNS      DNS

```
# tcpdump -i any port 53

06:20:00.441889 659246098c56_h P  ifindex 17 00:00:00:73:f1:06 ethertype IPv4 (0x0800), length 75: 10.16.0.2.40230 > 169.254.20.10.53: 1291+ A? baidu.com. (27)
06:20:00.441889 ovn0 In  ifindex 7 00:00:00:50:32:cd ethertype IPv4 (0x0800), length 75: 10.16.0.2.40230 > 169.254.20.10.53: 1291+ A? baidu.com. (27)
06:20:00.441950 659246098c56_h P  ifindex 17 00:00:00:73:f1:06 ethertype IPv4 (0x0800), length 75: 10.16.0.2.40230 > 169.254.20.10.53: 1611+ AAAA?
baidu.com. (27)
06:20:00.441950 ovn0 In  ifindex 7 00:00:00:50:32:cd ethertype IPv4 (0x0800), length 75: 10.16.0.2.40230 > 169.254.20.10.53: 1611+ AAAA? baidu.com. (27)
06:20:00.442203 ovn0 Out ifindex 7 00:00:00:52:99:d8 ethertype IPv4 (0x0800), length 145: 169.254.20.10.53 > 10.16.0.2.40230: 1611* 0/1/0 (97)
```

```

06:20:00.442219 659246098c56_h Out ifindex 17 00:00:00:ea:b3:5e ethertype IPv4 (0x0800), length 145: 169.254.20.10.53 > 10.16.0.2.40230: 1611* 0/1/0 (97)
06:20:00.442273 ovn0 Out ifindex 7 00:00:00:52:99:d8 ethertype IPv4 (0x0800), length 125: 169.254.20.10.53 > 10.16.0.2.40230: 1291* 2/0/0 A 39.156.66.10, A
110.242.68.66 (77)
06:20:00.442278 659246098c56_h Out ifindex 17 00:00:00:ea:b3:5e ethertype IPv4 (0x0800), length 125: 169.254.20.10.53 > 10.16.0.2.40230: 1291* 2/0/0 A 39.
156.66.10, A 110.242.68.66 (77)

```

## 7.24.3



NetworkPolicy      NetworkPolicy      DNS IP 169.254.20.10      CIDR      NetworkPolicy      DNS      Pod

### NetworkPolicy

Pod      DNS      NetworkPolicy

```

apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
  name: allow-local-dns-and-node-cidr
  namespace: default #
spec:
  podSelector: {} # Pod
  policyTypes:
  - Ingress
  - Egress
  egress:
  # DNS
  - to:
    - ipBlock:
      cidr: 169.254.20.10/32
  # CIDR
  - to:
    - ipBlock:
      cidr: 10.0.0.0/8 # CIDR
  ingress:
  # DNS
  - from:
    - ipBlock:
      cidr: 169.254.20.10/32
  # CIDR
  - from:
    - ipBlock:
      cidr: 10.0.0.0/8 # CIDR

```

- 169.254.20.10/32      DNS      IP
- 10.0.0.0/8      CIDR

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## 7.24.4

## 7.25 VPC NAT

### 7.25.1

|     |         |             |        |     |      |    |     |      |
|-----|---------|-------------|--------|-----|------|----|-----|------|
| VPC | Overlay | natOutgoing | Subnet | Pod | SNAT | IP | Pod | SNAT |
| NAT |         | CIDR        | IP     |     | SNAT |    |     |      |

### 7.25.2

subnet.Spec    natOutgoing    natOutgoingPolicyRules

```
spec:
  natOutgoing: true
  natOutgoingPolicyRules:
    - action: forward
      match:
        srcIPs: 10.0.11.0/30,10.0.11.254
    - action: nat
      match:
        srcIPs: 10.0.11.128/26
        dstIPs: 114.114.114.114,8.8.8.8
```

NAT

1. IP 10.0.11.0/30 10.0.11.254 SNAT
2. IP 10.0.11.128/26 IP 114.114.114.114 8.8.8.8 SNAT

|        |       |                |                        |     |         |           |      |                        |              |      |    |
|--------|-------|----------------|------------------------|-----|---------|-----------|------|------------------------|--------------|------|----|
| action | match | action, action | forward                | nat | forward | SNAT, nat | SNAT | natOutgoingPolicyRules |              |      |    |
|        |       |                |                        |     |         |           |      |                        |              |      |    |
| SNAT   |       |                |                        |     |         |           |      |                        |              |      |    |
| match  |       | srcIPs         | dstIPs                 |     |         | IP        | IP   | match.srcIPs           | match.dstIPs | CIDR | IP |
|        |       |                |                        |     |         |           |      |                        |              |      |    |
|        | match |                | natOutgoingPolicyRules |     |         |           |      |                        |              |      |    |
|        |       |                |                        |     |         |           |      |                        |              |      |    |

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### 7.25.3

## 8.

## 8.1

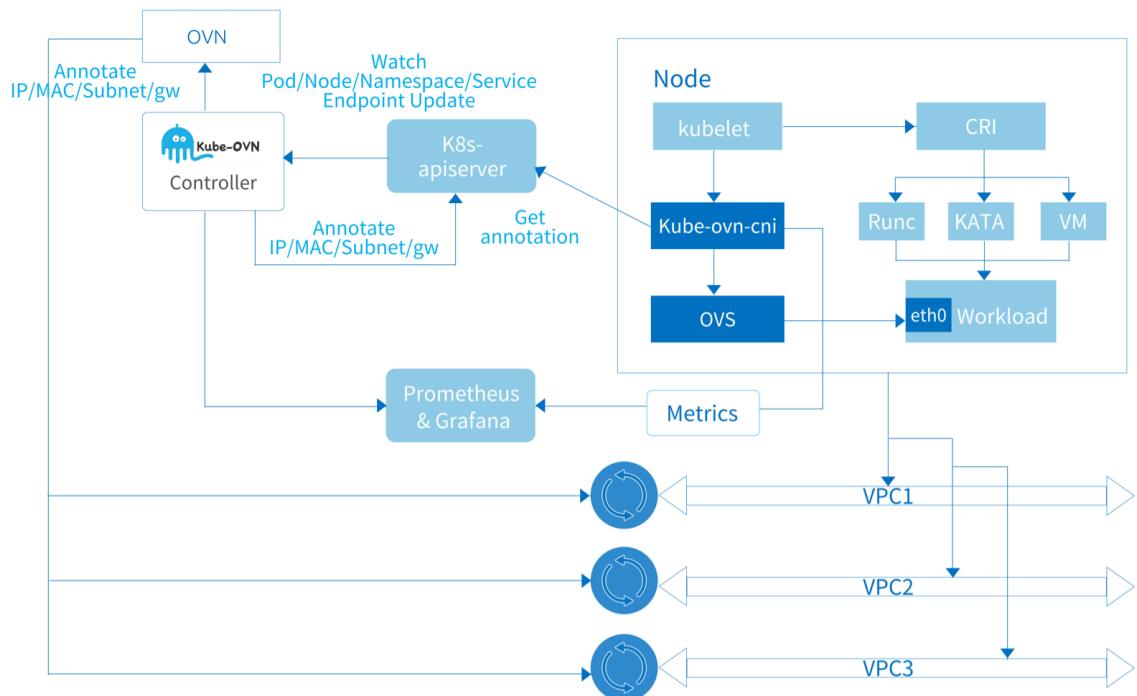
## Kube-OVN

|          |            |         |                                       |          |     |            |             |               |
|----------|------------|---------|---------------------------------------|----------|-----|------------|-------------|---------------|
| Kube-OVN | Kubernetes | OVN     | SDN                                   | Kube-OVN | OVN | Kubernetes | CNI Service | Networkpolicy |
| SDN      | VPC        | QoS ACL |                                       |          |     |            |             |               |
| Kube-OVN |            |         | Cilium Submariner Prometheus KubeVirt |          |     |            |             |               |

## 8.1.1

## Kube-OVN

- OVN/OVS
- Agent
- 



## OVN/OVS

| OVN/OVS | Kube-OVN | OVN/OVS    | SDN        | Kube-OVN | ovn-architecture(7) |
|---------|----------|------------|------------|----------|---------------------|
| OVN     | Kube-OVN | OVN        | Kubernetes |          |                     |
| OVN/OVS |          | Kubernetes |            |          |                     |

**OVN-CENTRAL**

```

ovn-central Deployment OVN          ovn-nb , ovn-sb , ovn-northd
  • ovn-nb           API      kube-ovn-controller   ovn-nb
  • ovn-sb           ovn-nb
  • ovn-northd     ovn-nb           ovn-sb
ovn-central       Raft

```

**OVS-OVN**

```

ovs-ovn  DaemonSet        Pod      openvswitch, ovsdb, ovn-controller    ovn-central  Agent

```

**Agent**

```
Kube-OVN      OVN  Kubernetes
```

**KUBE-OVN-CONTROLLER**

|            |            |            |              |                     |                 |
|------------|------------|------------|--------------|---------------------|-----------------|
| Deployment | Kubernetes | OVN        | Kube-OVN     | kube-ovn-controller | OVN             |
| Pod        | Service    | Endpoint   | Node         | NetworkPolicy       | VPC             |
| Pod        | annotation | IPAM       | ovn-central  | Subnet              | Vlan            |
| CIDR       |            | annotation | kube-ovn-cni |                     | ProviderNetwork |

**KUBE-OVN-CNI**

|           |          |                       |
|-----------|----------|-----------------------|
| DaemonSet | CNI      | OVS                   |
| DaemonSet | kube-ovn | kubelet  kube-ovn-cni |
|           |          | CNI      kube-ovn-cni |
|           |          | /opt/cni/bin          |

`kube-ovn-cni`

1. ovn-controller vswitchd
2. CNI add/del
  - a. veth OVS
  - b. OVS
  - c. iptables/ipset/route
3. QoS.
4. ovn0
5. Vlan/Underlay/EIP
- 6.

**Kube-OVN****KUBE-OVN-SPEAKER**

|           |        |
|-----------|--------|
| DaemonSet | Pod IP |
|           | BGP    |

**KUBE-OVN-PINGER**

|           |     |          |
|-----------|-----|----------|
| DaemonSet | OVS | Kube-OVN |
|-----------|-----|----------|

**KUBE-OVN-MONITOR**

|            |     |          |
|------------|-----|----------|
| Deployment | OVN | Kube-OVN |
|------------|-----|----------|

KUBECTL-KO

kubectl

kubectl

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8.1.2

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## 8.2 What's Next

---

This document lists the features merged into the master branch for the next minor release.

### 8.2.1 Post-v1.14.0

- ACL log supports ratelimiting. [#5938](#)
- Subnet with centralized gateway now supports nodeSelectors. [#5956](#)
- Overlay encapsulation NIC selection. [#5946](#)
- Performance: skip conntrack for specific dst CIDRs. [#5821](#)
- NetworkPolicy supports `lax` mode which only deny traffic type of TCP, UDP and SCTP. That means ARP, ICMP and DHCP traffic are always allowed. [#5745](#)
- Remove internal-port type interface code. [#5794](#)
- IPPool
  - Multiple IPPools now can bind to the same Namespace. [#5731](#)
  - Pods in a bound namespace will only get IPs from the bound pool(s), not other ranges in the subnet. [#5731](#)
  - IPPool will create an AddressSet that can be used with VPC Policy Route and ACL. [#5920](#)
  - AdminNetworkPolicy now supports specifying egress peers using FQDNs. [#5703](#)
  - Using ARP for IPv4 network ready check: now you don't need ACL allow rules for gateway to make Pod running. [#5716](#)
  - Non-primary CNI mode: you can run Kube-OVN as the secondary only network, without annoying unused annotations and logical switch port allocations. [#5618](#)
  - VPC NAT Gateway:
    - No default EIP mode: the secondary interface can initialize without a default EIP to avoid the waste. [#5605](#)
    - Custom routes: you can control the route rules within the `vpc-nat-gateway` Pods to control traffic paths. [#5608](#)
    - Gratuitous ARP: VPC NAT Gateway automatically sends gratuitous ARP packets during initialization to accelerate network convergence. [#5607](#)
    - Healthchecks for static endpoints in `SwitchLBRules`: SLR with both selector or endpoints key can support healthchecks. [#5435](#)
  - Underlay
    - Node Selectors for `ProviderNetwork`: instead of adding/removing nodes to the `ProviderNetwork` one by one, you can use node selectors to simplify the workflow. [#5518](#)
    - Different `NetworkProvider`s can now share the same VLAN. [#5471](#)
    - Auto create VLAN sub-interfaces. [#5966](#)
    - Auto move VLAN sub-interfaces to OVS bridges. [#5949](#)
    - Adding `pod_name` and `pod_namespace` labels to interface metrics. [#5463](#)
  - IPSec
    - Support `cert-manager` to issue certificates. [#5365](#)
    - Request new certificate if current certificate is not trusted. [#5710](#)
  - kubectl-ko
  - Collect IPSec and xFRM information. [#5472](#)
  - Replace `Endpoint` with `EndpointSlice`. [#5425](#)
  - NetworkAttachment caching: reduce APIServer load in large-scale deployments with Multus. [#5386](#)
  - Upgrade ovs to 3.5 and ovn to 25.03. [#5537](#)



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8.2.2

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## 8.3

---

### Kube-OVN

#### 8.3.1

##### Kube-OVN

```
1. default      Pod   IP           CIDR  10.16.0.0/16      10.16.0.1
2. join        Node  Pod          ,     CIDR  100.64.0.0/16    100.64.0.1
```

```
POD_CIDR="10.16.0.0/16"
POD_GATEWAY="10.16.0.1"
JOIN_CIDR="100.64.0.0/16"
EXCLUDE_IPS=""
```

```
EXCLUDE_IP    POD_CIDR          192.168.10.20..192.168.10.30
```

Overlay              Service CIDR

[Join](#)

#### 8.3.2 Service

```
kube-proxy  iptables       Kube-OVN      Kube-OVN  Service  CIDR
```

```
SVC_CIDR="10.96.0.0/12"
```

[kube-ovn-controller Deployment](#)

```
args:
- --service-cluster-ip-range=10.96.0.0/12
```

#### 8.3.3 Overlay

Kube-OVN        Kubernetes Node IP

```
IFACE=eth1
```

```
ens[a-z0-9]*,eth[a-z0-9]*
```

[kube-ovn-cni DaemonSet](#)

```
args:
- --iface=eth1
```

```
annotation ovn.kubernetes.io/tunnel_interface annotation  iface annotation
```

```
kubectl annotate node no1 ovn.kubernetes.io/tunnel_interface=ethx
```

[Overlay](#)

#### 8.3.4 MTU

```
Overlay          Kube-OVN          MTU          MTU          Overlay    Pod   MTU      MTU - 100 Underlay  Pod
MTU

Overlay     MTU      kube-ovn-cni DaemonSet

args:
- --mtu=1333
```

### 8.3.5

```
Kube-OVN           mirror0          tcpdump  
=true  
be-ovn-cni DaemonSet      :  
rror=true
```

### 8.3.6 LB

```
Underlay      kube-proxy          Service           OVN     L2 LB      ClusterIP    Service      LB
              ClusterIP          kube-proxy        kube-proxy

ENABLE_LB=false

kube-ovn-controller Deployment

args:
- --enable-lb=false

LB

Kube-OVN v1.12.0      subnet crd      spec  enableLb  Kube-OVN  LB      LB      kube-ovn-controller
Deployment   enable-lb      load-balancer  enableLb  enableLb  load-balancer  v1.12.0  enableLb
```

### 8.3.7 NetworkPolicy

### 8.3.8 FIP SNAT

EIP SNAT kube-ovn-controller

```
ENABLE_EIP_SNAT=false
```

#### kube-ovn-controller Deployment

```
args:
- --enable-eip-snat=false
```

EIP SNAT

EIP SNAT

### 8.3.9 Load Balancer Service

VPC      Load Balancer Service

LoadBalancer Service

```
ENABLE_LB_SVC=true
```

#### kube-ovn-controller Deployment

```
args:
- --enable-lb-svc=true
```

### 8.3.10 ECMP

ECMP      ECMP

kube-ovn-controller Deployment

:

```
args:
- --enable-ecmp=true
```

|                  |             |                 |      |      |                     |
|------------------|-------------|-----------------|------|------|---------------------|
| Kube-OVN v1.12.0 | subnet crd  | spec enableEcmp | ECMP | ECMP | kube-ovn-controller |
| Deployment       | enable-ecmp | v1.12.0         |      |      |                     |

### 8.3.11 Kubevirt VM

Kubevirt VM kube-ovn-controller

StatefulSet Pod

IP

VM

1.10.6

kube-ovn-controller Deployment

```
args:
- --keep-vm-ip=false
```

### 8.3.12 CNI

Kube-OVN /opt/cni/bin CNI /etc/cni/net.d CNI 01-kube-ovn.conflist CNI

```
CNI_CONF_DIR="/etc/cni/net.d"
CNI_BIN_DIR="/opt/cni/bin"
CNI_CONFIG_PRIORITY="01"
```

#### kube-ovn-cni DaemonSet Volume

```
volumes:
- name: cni-conf
  hostPath:
    path: "/etc/cni/net.d"
- name: cni-bin
  hostPath:
    path: "/opt/cni/bin"
...
args:
- --cni-conf-name=01-kube-ovn.conflist
```

### 8.3.13

Kube-OVN   Overlay   Geneve   Vxlan   STT

```
TUNNEL_TYPE="vxlan"
```

ovs-ovn DaemonSet

```
env:
- name: TUNNEL_TYPE
  value: "vxlan"
```

STT   ovs

### 8.3.14 SSL

OVN DB   API   SSL :

```
ENABLE_SSL=true
```

SSL

### 8.3.15 ip

kube-ovn-controller/kube-ovn-cni/kube-ovn-monitor   ip   0.0.0.0   ip

```
ENABLE_BIND_LOCAL_IP=true
```

kube-ovn-monitor   pod ip

```
# netstat -tunlp |grep kube-ovn
tcp        0      0 172.18.0.5:10661          0.0.0.0:*              LISTEN      2612/.kube-ovn-mon
```

deployment   daemonSet

```
env:
- name: ENABLE_BIND_LOCAL_IP
  value: "false"
```

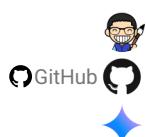
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### 8.3.16

## 8.4

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|          |       |       |       |         |     |       |     |     |
|----------|-------|-------|-------|---------|-----|-------|-----|-----|
| Kube-OVN | Minor | Patch | Minor | OVN/OVS | API | Patch | Bug | API |
|----------|-------|-------|-------|---------|-----|-------|-----|-----|

### 8.4.1

|          |  |                      |              |     |              |  |     |
|----------|--|----------------------|--------------|-----|--------------|--|-----|
| Kube-OVN |  | master, release-1.12 | release-1.11 |     | release-1.12 |  | Bug |
| backport |  |                      |              |     |              |  |     |
|          |  | release-1.11         | backport     | Bug |              |  |     |

### 8.4.2

|       |  |       |     |     |
|-------|--|-------|-----|-----|
| Minor |  | Patch | Bug | Bug |
|-------|--|-------|-----|-----|

### 8.4.3 Patch

|       |                                 |                 |          |  |              |         |  |  |
|-------|---------------------------------|-----------------|----------|--|--------------|---------|--|--|
| Patch | <a href="#">hack/release.sh</a> |                 |          |  |              |         |  |  |
| 1.    | Build                           |                 |          |  |              |         |  |  |
| 2.    | tag                             | Docker Hub      |          |  |              |         |  |  |
| 3.    | tag                             | Github          |          |  |              |         |  |  |
| 4.    |                                 |                 |          |  |              |         |  |  |
| 5.    |                                 |                 |          |  |              |         |  |  |
| 6.    | Release Note PR                 |                 |          |  |              |         |  |  |
| 7.    | Release Note ( )                |                 |          |  |              |         |  |  |
| 8.    | Merge github action             | Release Note PR |          |  |              |         |  |  |
| 9.    | Github Release                  |                 |          |  |              |         |  |  |
| 10.   | Github Release                  | Release         | v1.12.12 |  | Release Note | Release |  |  |

### 8.4.4 Minor

|       |  |                            |                    |       |              |         |  |  |  |
|-------|--|----------------------------|--------------------|-------|--------------|---------|--|--|--|
| Minor |  |                            |                    |       |              |         |  |  |  |
| 1.    | Github   | release-1.13               | ( )                |       |              |         |  |  |  |
| 2.    | VERSION, dist/images/install.sh, charts/kube-ovn/values.yaml | charts/kube-ovn/Chart.yaml |                    | Minor | v1.14.0      | ( )     |  |  |  |
| 3.    | tag  | Docker Hub ( )             |                    |       |              |         |  |  |  |
| 4.    | tag  | Github ( )                 |                    |       |              |         |  |  |  |
| 5.    | v1.13  | mkdocs.yml                 | version branch ( ) |       |              |         |  |  |  |
| 6.    | Release Note PR  |                            |                    |       |              |         |  |  |  |
| 7.    | Release Note ( )   |                            |                    |       |              |         |  |  |  |
| 8.    | Merge github action  | Release Note PR            |                    |       |              |         |  |  |  |
| 9.    | Github Release   |                            |                    |       |              |         |  |  |  |
| 10.   | Github Release   | Release                    | v1.13.0            |       | Release Note | Release |  |  |  |
| 11.   | VERSION  | Patch                      | v1.13.1            |       |              |         |  |  |  |



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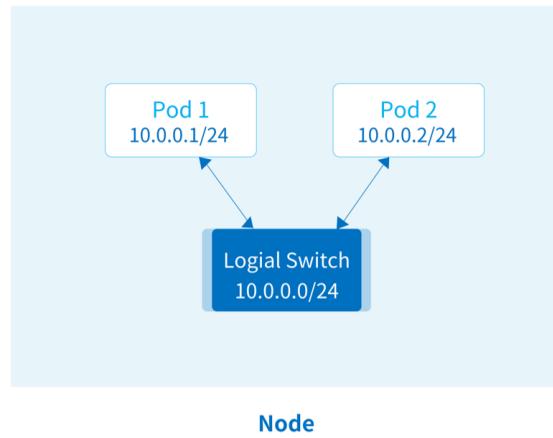
8.4.5

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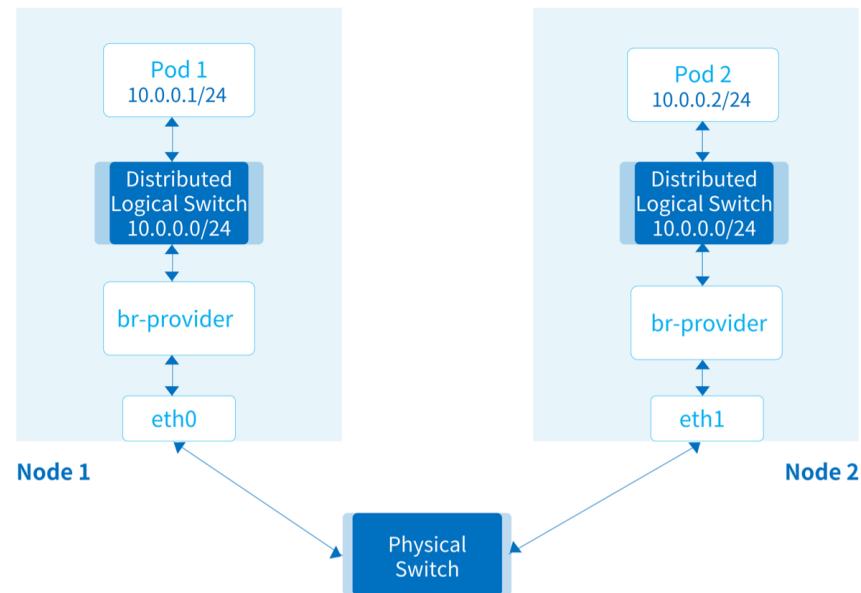
## 8.5 Underlay

### Underlay

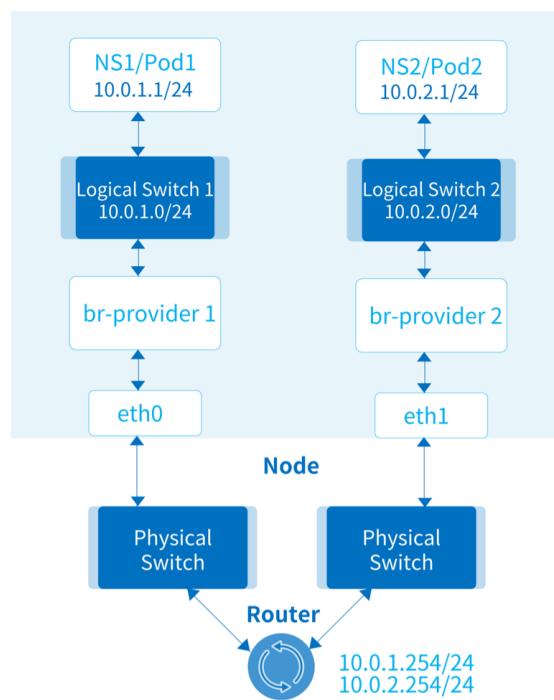
#### 8.5.1



#### 8.5.2



## 8.5.3

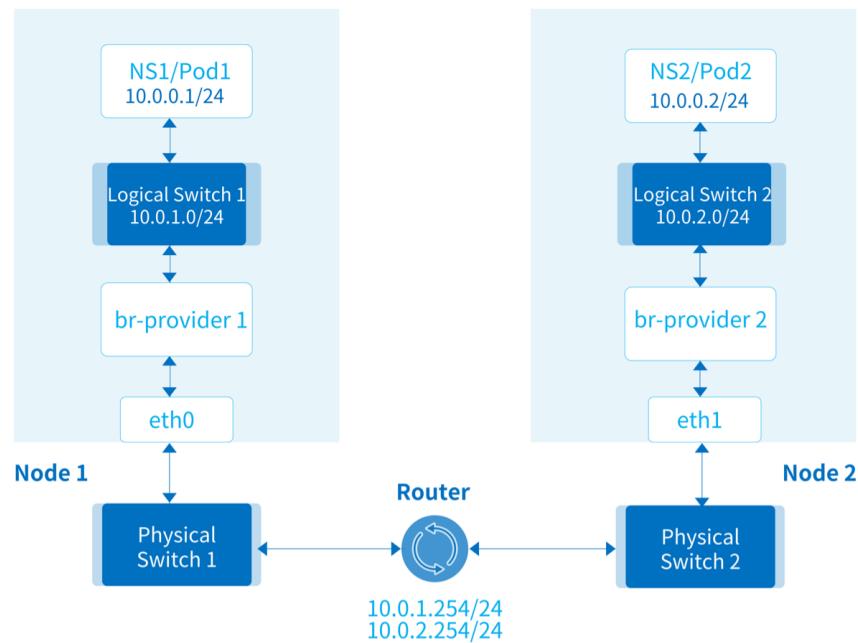


br-provider-1 br-provider-2

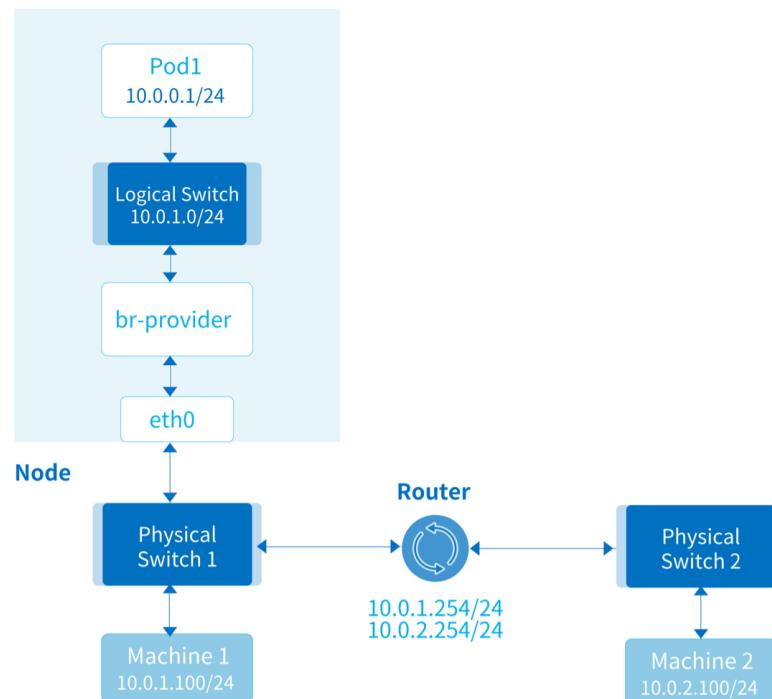
OVS

Provider Network

## 8.5.4

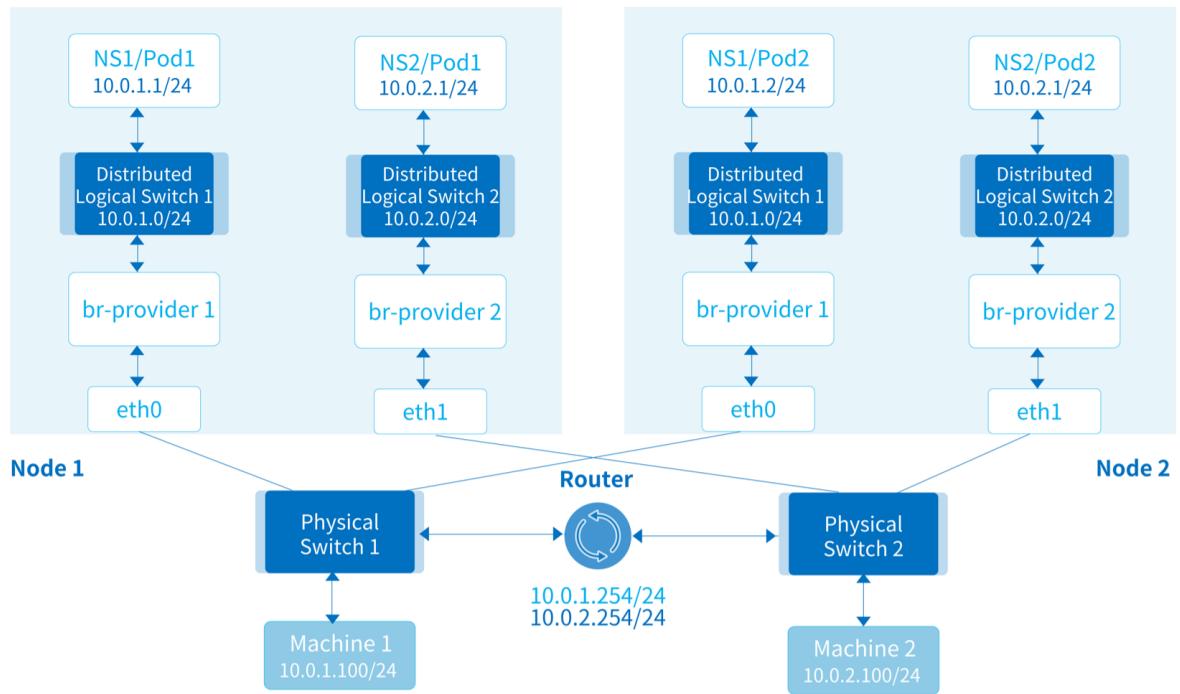


## 8.5.5

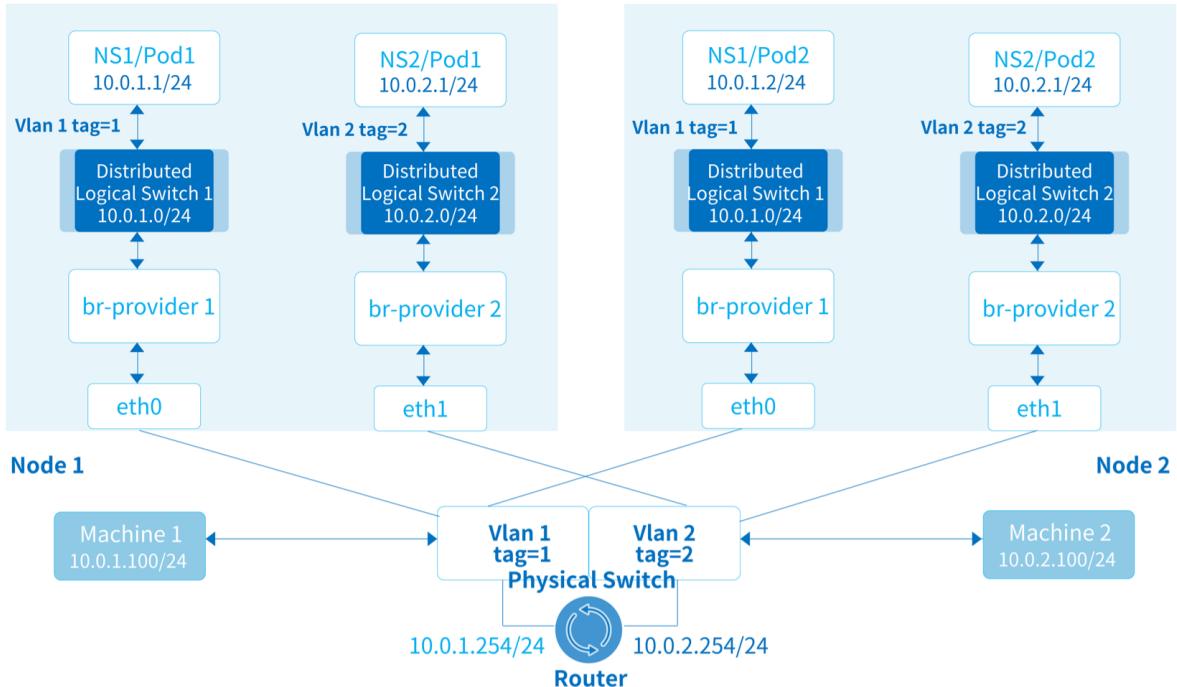


Pod

## 8.5.6 Vlan Tag

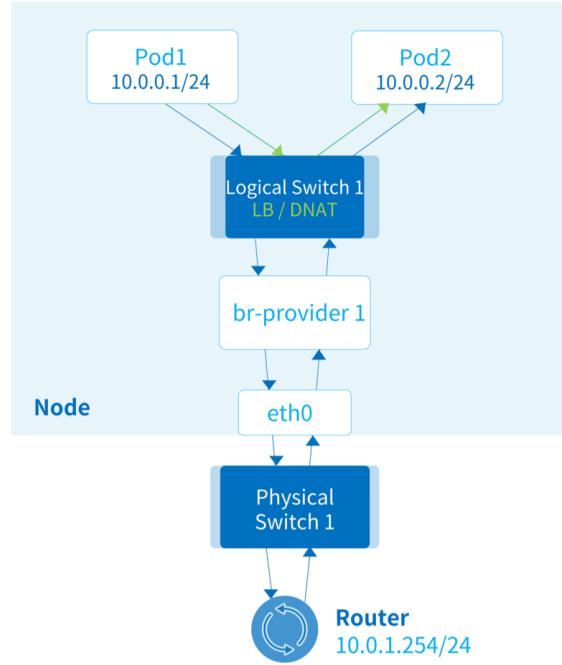
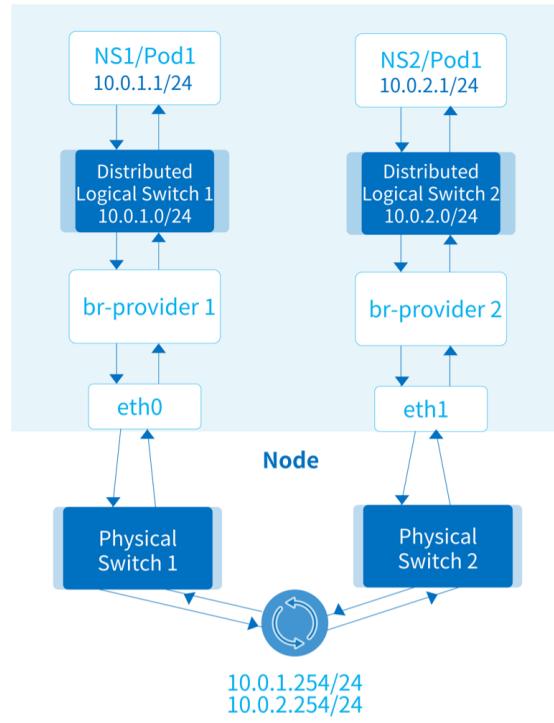


### 8.5.7 VLAN



### 8.5.8 Pod Service IP

| Kube-OVN | Kubernetes Service | DNAT | IP | Service | Pod Endpoint | Service IP IP | Pod MAC | Service IP MAC | MAC |
|----------|--------------------|------|----|---------|--------------|---------------|---------|----------------|-----|
|----------|--------------------|------|----|---------|--------------|---------------|---------|----------------|-----|

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8.5.9

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## 8.6 Iptables

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Kube-OVN    ipset    iptables    VPC    Overlay    NAT

ipset

| IPv4/IPv6   |          |                        |                  |
|---|----------|------------------------|------------------|
| ovn40services/ovn60services                             | hash:net | Service                |                  |
| ovn40subnets/ovn60subnets                               | hash:net | Overlay                | NodeLocal DNS IP |
| ovn40subnets-nat/ovn60subnets-nat                       | hash:net | NatOutgoing            | Overlay          |
| ovn40subnets-distributed-gw/ovn60subnets-distributed-gw | hash:net | Overlay                |                  |
| ovn40other-node/ovn60other-node                         | hash:net | IP                     |                  |
| ovn40local-pod-ip-nat/ovn60local-pod-ip-nat             | hash:ip  |                        |                  |
| ovn40subnets-nat-policy                                 | hash:net | natOutgoingPolicyRules |                  |
| ovn40natpr-418e79269dc5-dst                             | hash:net | natOutgoingPolicyRules | rule dstIPs      |
| ovn40natpr-418e79269dc5-src                             | hash:net | natOutgoingPolicyRules | rule srcIPs      |

iptables IPv4

| Iptables Rules |                |  |                        |  |
|----------------|----------------|--|------------------------|--|
| filter         | INPUT          | -m set --match-set ovn40services src -j ACCEPT   | k8s Service Pod        | --   |
| filter         | INPUT          | -m set --match-set ovn40services dst -j ACCEPT   |                        | --   |
| filter         | INPUT          | -m set --match-set ovn40subnets src -j ACCEPT  |                        | --   |
| filter         | INPUT          | -m set --match-set ovn40subnets dst -j ACCEPT  |                        | --   |
| filter         | FORWARD        | -m set --match-set ovn40services src -j ACCEPT   |                        | --   |
| filter         | FORWARD        | -m set --match-set ovn40services dst -j ACCEPT   |                        | --   |
| filter         | FORWARD        | -m set --match-set ovn40subnets src -j ACCEPT  |                        | --   |
| filter         | FORWARD        | -m set --match-set ovn40subnets dst -j ACCEPT  |                        | --   |
| filter         | FORWARD        | -s 10.16.0.0/16 -m comment --comment "ovn-subnet-gateway,ovn-default"  | subnet                 | 10.16.0.0/16 subnet cidr comment ovn-subnet-gateway iptables subnet ovn-default subnet |
| filter         | FORWARD        | -d 10.16.0.0/16 -m comment --comment "ovn-subnet-gateway,ovn-default"  | subnet                 |  |
| filter         | OUTPUT         | -p udp -m udp --dport 6081 -j MARK --set-xmark 0x0   | SNAT                   | UDP: bad checksum on VXLAN interface   |
| nat            | PREROUTING     | -m comment --comment "kube-ovn prerouting rules" -j OVN-PREROUTING   | OVN-PREROUTING         | --   |
| nat            | POSTROUTING    | -m comment --comment "kube-ovn postrouting rules" -j OVN-POSTROUTING   | OVN-POSTROUTING        | --   |
| nat            | OVN-PREROUTING | -i ovn0 -m set --match-set ovn40subnets src -m set --match-set ovn40services dst -j MARK --set-xmark 0x4000/0x4000 | Pod Service masquerade | LB   |
| nat            | OVN-PREROUTING | -p tcp -m addrtype --dst-type LOCAL -m set --match-  |                        | kube-proxy ipvs  |

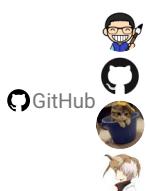
|     |                     |  |  |                                      |                 |
|-----|---------------------|--|--|--------------------------------------|-----------------|
|     |                     | set KUBE-NODE-PORT-<br>LOCAL-TCP dst -j MARK --<br>set-xmark<br>0x80000/0x80000  | ExternalTrafficPolicy<br>Local Service TCP                 |                                      |                 |
| nat | OVN-<br>PREROUTING  | -p udp -m addrtype --dst-<br>type LOCAL -m set --match-<br>set KUBE-NODE-PORT-<br>LOCAL-UDP dst -j MARK --<br>set-xmark<br>0x80000/0x80000 | ExternalTrafficPolicy<br>Local Service UDP                 |                                      |                 |
| nat | OVN-<br>POSTROUTING | -m set --match-set<br>ovn40services src -m set --<br>match-set ovn40subnets<br>dst -m mark --mark<br>0x4000/0x4000 -j SNAT --<br>to-source | Service IP<br>Overlay Pod IP                               |                                      | kube-proxy ipvs |
| nat | OVN-<br>POSTROUTING | -m mark --mark<br>0x4000/0x4000 -j<br>MASQUERADE   | SNAT   | --                                   |                 |
| nat | OVN-<br>POSTROUTING | -m set --match-set<br>ovn40subnets src -m set --<br>match-set ovn40subnets<br>dst -j MASQUERADE  | Pod Service<br>SNAT  | --                                   |                 |
| nat | OVN-<br>POSTROUTING | -m mark --mark<br>0x80000/0x80000 -m set --<br>match-set ovn40subnets-<br>distributed-gw dst -j<br>RETURN                                  | ExternalTrafficPolicy<br>Local Service<br>Endpoint<br>SNAT | --                                   |                 |
| nat | OVN-<br>POSTROUTING | -m mark --mark<br>0x80000/0x80000 -j<br>MASQUERADE   | ExternalTrafficPolicy<br>Local Service<br>Endpoint<br>SNAT | --                                   |                 |
| nat | OVN-<br>POSTROUTING | -p tcp -m tcp --tcp-flags<br>SYN NONE -m conntrack --<br>ctstate NEW -j RETURN   | Pod IP   | SNAT                                 | --              |
| nat | OVN-<br>POSTROUTING | -s 10.16.0.0/16 -m set ! --<br>match-set ovn40subnets<br>dst -j SNAT --to-source<br>192.168.0.101  | Pod<br>NatOutgoing IP<br>SNAT                              | 10.16.0.0/16<br>IP                   | 192.168.0.101   |
| nat | OVN-<br>POSTROUTING | -m set --match-set<br>ovn40subnets-nat src -m<br>set ! --match-set<br>ovn40subnets dst -j<br>MASQUERADE                                    | Pod<br>NatOutgoing SNAT                                    | --                                   |                 |
| nat | OVN-<br>POSTROUTING | -m set --match-set<br>ovn40subnets-nat-policy<br>src -m set ! --match-set<br>ovn40subnets dst -j OVN-<br>NAT-POLICY                        | Pod<br>natOutgoingPolicyRules<br>SNAT                      | natOutgoingPolicyRules<br>NAT-POLICY | OVN             |
| nat |                     |  |  |                                      |                 |

|        |                                      |  |   |               |
|--------|--------------------------------------|--|---|---------------|
|        | OVN-<br>POSTROUTING                  | -m mark --mark<br>0x90001/0x90001 -j<br>MASQUERADE --random-<br>fully  | OVN-NAT-POLICY<br>0x90001/0x90001   | tag<br>SNAT   |
| nat    | OVN-<br>POSTROUTING                  | -m mark --mark<br>0x90002/0x90002 -j<br>RETURN   | OVN-NAT-POLICY<br>0x90002/0x90002   | , tag<br>SNAT |
| nat    | OVN-NAT-POLICY                       | -s 10.0.11.0/24 -m<br>comment --comment<br>natPolicySubnet-net1 -j<br>OVN-NAT-PSUBNET-<br>aa98851157c5   | 10.0.11.0/24 net1 CIDR OVN-NAT-<br>PSUBNET-aa98851157c5<br>natOutgoingPolicyRules   |               |
| nat    | OVN-NAT-<br>PSUBNET-<br>xxxxxxxxxxxx | -m set --match-set<br>ovn40natpr-418e79269dc5-<br>src src -m set --match-set<br>ovn40natpr-418e79269dc5-<br>dst dst -j MARK --set-xmark<br>0x90002/0x90002 | 418e79269dc5 natOutgoingPolicyRules<br>ID<br>status.natOutgoingPolicyRules[index].Rule<br>srcIPs ovn40natpr-418e79269dc5-<br>src dstIPs ovn40natpr-418e79269dc5-<br>dst tag 0x90002 |               |
| mangle | OVN-OUTPUT                           | -d 10.241.39.2/32 -p tcp -m<br>tcp -dport 80 -j MARK --set-<br>xmark 0x90003/0x90003   | kubelet<br>tproxy   |               |
| mangle | OVN-<br>PREROUTING                   | -d 10.241.39.2/32 -p tcp -m<br>tcp -dport 80 -j TPROXY --<br>on-port 8102 --on-ip<br>172.18.0.3 --tproxy-mark<br>0x90004/0x90004                           | kubelet<br>tproxy   |               |

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8.6.1

## 8.7

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### 8.7.1

Kube-OVN      Github      /      Github      Issue      PR      Maintainer      Review      Github Action

### 8.7.2

Kube-OVN      Go      Go Modules      G0111MODULE="on"

golangci-lint      local-installation

Kube-OVN      Docker buildx      Docker      buildx:

```
docker buildx create --use
```

### 8.7.3

Kube-OVN

```
git clone https://github.com/kubeovn/kube-ovn.git
cd kube-ovn
make release
```

ARM

```
make release-arm
```

### 8.7.4 base

OVS/OVN      base

base      Dockerfile      dist/images/Dockerfile.base

```
# build x86 base image
make base-amd64

# build arm base image
make base-arm64
```

### 8.7.5 E2E

Kube-OVN :

- KIND      Kubernetes      go install sigs.k8s.io/kind@latest
- jinjanator      : pip install jinjanator
- Ginkgo      go install github.com/onsi/ginkgo/v2/ginkgo; go get github.com/onsi/gomega/...

E2E

```
make kind-init
make kind-install
make e2e
```

Underlay E2E

```
make kind-init
make kind-install-underlay
make e2e-underlay-single-nic
```

ovn vpc nat gw eip, fip, snat, dnat

```
make kind-init
make kind-install
make ovn-vpc-nat-gw-conformance-e2e
```

iptables vpc nat gw eip, fip, snat, dnat

```
make kind-init
make kind-install-vpc-nat-gw
make iptables-vpc-nat-gw-conformance-e2e
```

loadbalancer service

```
make kind-init
make kind-install-lb-svc
make kube-ovn-lb-svc-conformance-e2e
```

```
make kind-clean
```

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8.7.6

## 8.8 OVS/OVN

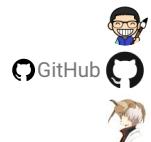
|         |          |            |          |          |         |
|---------|----------|------------|----------|----------|---------|
| OVN/OVS | SDN      | Kubernetes | Kube-OVN | Kube-OVN | OVN/OVS |
| OVN/OVS | Kube-OVN |            |          |          |         |

- [4228eab1d7](#) vswitchd ofport\_usage
- [54056ea65d](#) timer
- [6b4dccb311f](#) fdb
- [f627b7721e](#) hairpin fdb
- [3f3e3a436f](#) ovsdb-tool join-cluster Server ID
- [a6cb8215a8](#) QoS
- [d4d76ddb2e](#) ovsdb-tool fix-cluster
- [ffd2328d4a](#) netdev CPU
- [d088c5d8c2](#) ovs-router kube-ipvs0
- [1b31f07dc6](#)
- [54b7678229](#) ovs-sandbox docker run
- [9ee66bd91b](#)
- [e889d46924](#) Underlay resubmit
- [f9e97031b5](#) ovn-controller Kube-OVN localnet GARP
- [78cade0187](#) conntrack
- [85aa6263ad](#) northd DNS IP conntrack
- [34dc3e3fcf](#) lflow lport conntrack
- [a297b840c2](#) DNAT lsp
- [03e35ed9c5](#) ovn-controller
- [e7d3ba53cd](#) ACL DNS IP conntrack
- [9286e1fd57](#)
- [e5916eb53a](#) lr-lb DNAT
- [e4e6ea9c5f](#) BFD LRP
- [e76880e792](#) northd nb version\_compatibility
- [477695a010](#) northd localnet lrp arp/nd
  
- [20626ea909](#) LB ACL
- [a2d9ff3cccd](#) Deb



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8.8.1

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## 8.9

Kube-OVN OVN/OVS Geneve Vxlan STT OVN  
[OVN Architecture Design Decision](#)

### 8.9.1 Geneve

|          |              |                |          |        |       |
|----------|--------------|----------------|----------|--------|-------|
| Geneve   | Kube-OVN     | OVN            | Offload  | Geneve | 24bit |
| datapath |              | datapath 32768 |          |        |       |
| Mellanox | OVS Geneve   | 5.4            | backport |        |       |
| UDP      | TCP over UDP | TCP            | CPU      |        |       |

### 8.9.2 Vxlan

|               |              |            |     |          |               |
|---------------|--------------|------------|-----|----------|---------------|
| Vxlan         | OVN          | Offload    | OVN | datapath | 4096 datapath |
| datapath 4096 |              | inport ACL |     |          |               |
| Mellanox      | OVS Vxlan    |            |     |          |               |
| UDP           | TCP over UDP | TCP        | CPU |          |               |

### 8.9.3 STT

#### ⚠ Warning

OpenVswitch 3.6 STT Tunnel

|     |     |     |     |     |     |          |
|-----|-----|-----|-----|-----|-----|----------|
| STT | OVN | TCP | TCP | TCP | OVN | datapath |
|     |     | OVS |     |     |     |          |
|     |     | OVS |     |     |     |          |

### 8.9.4

- [VXLAN vs GENEVE: Understand The Difference](#)
- [OVN FAQ](#)
- [What is Geneve](#)

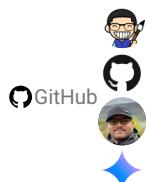
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[!\[\]\(be47ef0694efee86ac0d8e28335f23cf\_img.jpg\) Slack](#)

[!\[\]\(23fc0d8fb38c18433357797bcf9a20c5\_img.jpg\) Support](#)

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## 8.9.5

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## 8.10 Kube-OVN

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### Kube-OVN

#### 8.10.1 ovn-monitor

##### OVN

|       |   |  |              |                |     |
|-------|---|--|--------------|----------------|-----|
| Gauge | kube_ovn_ovn_status                               | OVN                                    | (2) follower | (1) leader,    | (0) |
| Gauge | kube_ovn_failed_req_count                         | OVN                                    |              |                |     |
| Gauge | kube_ovn_log_file_size_bytes                      | OVN                                    |              |                |     |
| Gauge | kube_ovn_db_file_size_bytes                       | OVN                                    |              |                |     |
| Gauge | kube_ovn_chassis_info                             | OVN chassis                            | (1)          | (0)            |     |
| Gauge | kube_ovn_db_status                                | OVN                                    | , (1)        | (0)            |     |
| Gauge | kube_ovn_logical_switch_info                      | OVN logical switch                     | (1)          | logical switch |     |
| Gauge | kube_ovn_logical_switch_external_id               | OVN logical switch external_id         | (1)          | external-id    |     |
| Gauge | kube_ovn_logical_switch_port_binding              | OVN logical switch logical switch port | (1)          |                |     |
| Gauge | kube_ovn_logical_switch_tunnel_key                | OVN logical switch tunnel key          |              |                |     |
| Gauge | kube_ovn_logical_switch_ports_num                 | OVN logical switch logical port        |              |                |     |
| Gauge | kube_ovn_logical_switch_port_info                 | OVN logical switch port                | (1)          |                |     |
| Gauge | kube_ovn_logical_switch_port_tunnel_key           | OVN logical switch port tunnel key     |              |                |     |
| Gauge | kube_ovn_cluster_enabled                          | (1) OVN                                | (0) OVN      |                |     |
| Gauge | kube_ovn_cluster_role                             |  | (1)          |                |     |
| Gauge | kube_ovn_cluster_status                           |  | (1)          |                |     |
| Gauge | kube_ovn_cluster_term                             | RAFT term                              |              |                |     |
| Gauge | kube_ovn_cluster_leader_self                      |  | leader (1)   | (0)            |     |
| Gauge | kube_ovn_cluster_vote_self                        |  | leader (1)   | (0)            |     |
| Gauge | kube_ovn_cluster_election_timer                   | election timer                         |              |                |     |
| Gauge | kube_ovn_cluster_log_not_committed                | commit RAFT                            |              |                |     |
| Gauge | kube_ovn_cluster_log_not_applied                  | apply RAFT                             |              |                |     |
| Gauge | kube_ovn_cluster_log_index_start                  | RAFT                                   |              |                |     |
| Gauge | kube_ovn_cluster_log_index_next                   | RAFT                                   |              |                |     |
| Gauge | kube_ovn_cluster_inbound_connections_total        |  |              |                |     |
| Gauge | kube_ovn_cluster_outbound_connections_total       |  |              |                |     |
| Gauge | kube_ovn_cluster_inbound_connections_error_total  |  |              |                |     |
| Gauge | kube_ovn_cluster_outbound_connections_error_total |  |              |                |     |

## 8.10.2 ovs-monitor

ovsdb vswitchd

|       |                         |                                |     |     |
|-------|-------------------------|--------------------------------|-----|-----|
| Gauge | ovs_status              | OVS                            | (1) | (0) |
| Gauge | ovs_info                | OVS                            | (1) |     |
| Gauge | failed_req_count        | OVS                            |     |     |
| Gauge | log_file_size           | OVS                            |     |     |
| Gauge | db_file_size            | OVS                            |     |     |
| Gauge | datapath                | Datapath                       | (1) |     |
| Gauge | dp_total                | OVS datapath                   |     |     |
| Gauge | dp_if                   | Datapath                       | (1) |     |
| Gauge | dp_if_total             | datapath port                  |     |     |
| Gauge | dp_flows_total          | Datapath flow                  |     |     |
| Gauge | dp_flows_lookup_hit     | Datapath flow                  |     |     |
| Gauge | dp_flows_lookup_missed  | Datapath flow                  |     |     |
| Gauge | dp_flows_lookup_lost    | Datapath userspace             |     |     |
| Gauge | dp_masks_hit            | Datapath mask                  |     |     |
| Gauge | dp_masks_total          | Datapath mask                  |     |     |
| Gauge | dp_masks_hit_ratio      | Datapath mask                  |     |     |
| Gauge | interface               | OVS (1)                        |     |     |
| Gauge | interface_admin_state   | (0) down, (1) up, (2)          |     |     |
| Gauge | interface_link_state    | (0) down, (1) up, (2)          |     |     |
| Gauge | interface_mac_in_use    | OVS Interface MAC              |     |     |
| Gauge | interface_mtu           | OVS Interface MTU              |     |     |
| Gauge | interface_of_port       | OVS Interface OpenFlow Port ID |     |     |
| Gauge | interface_if_index      | OVS Interface Index            |     |     |
| Gauge | interface_tx_packets    | OVS Interface                  |     |     |
| Gauge | interface_tx_bytes      | OVS Interface                  |     |     |
| Gauge | interface_rx_packets    | OVS Interface                  |     |     |
| Gauge | interface_rx_bytes      | OVS Interface                  |     |     |
| Gauge | interface_rx_crc_err    | OVS Interface                  |     |     |
| Gauge | interface_rx_dropped    | OVS Interface                  |     |     |
| Gauge | interface_rx_errors     | OVS Interface                  |     |     |
| Gauge | interface_rx_frame_err  | OVS Interface                  |     |     |
| Gauge | interface_rx_missed_err | OVS Interface miss             |     |     |
| Gauge | interface_rx_over_err   | OVS Interface overrun          |     |     |
| Gauge | interface_tx_dropped    | OVS Interface                  |     |     |

|       |                      |               |
|-------|----------------------|---------------|
| Gauge | interface_tx_errors  | OVS Interface |
| Gauge | interface_collisions | OVS interface |

### 8.10.3 kube-ovn-pinger

|           |                                  |                                  |
|-----------|----------------------------------|----------------------------------|
| Gauge     | pinger_ovs_up                    | OVS                              |
| Gauge     | pinger_ovs_down                  | OVS                              |
| Gauge     | pinger_ovn_controller_up         | ovn-controller                   |
| Gauge     | pinger_ovn_controller_down       | ovn-controller                   |
| Gauge     | pinger_inconsistent_port_binding | OVN-SB portbinding OVS interface |
| Gauge     | pinger_apiserver_healthy         | kube-ovn-pinger apiserver        |
| Gauge     | pinger_apiserver_unhealthy       | kube-ovn-pinger apiserver        |
| Histogram | pinger_apiserver_latency_ms      | kube-ovn-pinger apiserver        |
| Gauge     | pinger_internal_dns_healthy      | kube-ovn-pinger                  |
| Gauge     | pinger_internal_dns_unhealthy    | kube-ovn-pinger                  |
| Histogram | pinger_internal_dns_latency_ms   | kube-ovn-pinger                  |
| Gauge     | pinger_external_dns_health       | kube-ovn-pinger                  |
| Gauge     | pinger_external_dns_unhealthy    | kube-ovn-pinger                  |
| Histogram | pinger_external_dns_latency_ms   | kube-ovn-pinger                  |
| Histogram | pinger_pod_ping_latency_ms       | kube-ovn-pinger ping Pod         |
| Gauge     | pinger_pod_ping_lost_total       | kube-ovn-pinger ping Pod         |
| Gauge     | pinger_pod_ping_count_total      | kube-ovn-pinger ping Pod         |
| Histogram | pinger_node_ping_latency_ms      | kube-ovn-pinger ping Node        |
| Gauge     | pinger_node_ping_lost_total      | kube-ovn-pinger ping Node        |
| Gauge     | pinger_node_ping_count_total     | kube-ovn-pinger ping Node        |
| Histogram | pinger_external_ping_latency_ms  | kube-ovn-pinger ping             |
| Gauge     | pinger_external_lost_total       | kube-ovn-pinger ping             |

## 8.10.4 kube-ovn-controller

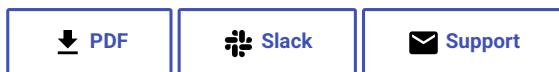
`kube-ovn-controller`

| Histogram | rest_client_request_latency_seconds     | apiserver        |
|-----------|---|------------------|
| Counter   | rest_client_requests_total              | apiserver        |
| Counter   | lists_total                             | API list         |
| Summary   | list_duration_seconds                   | API list         |
| Summary   | items_per_list                          | API list         |
| Counter   | watches_total                           | API watch        |
| Counter   | short_watches_total                     | API watch        |
| Summary   | watch_duration_seconds                  | API watch        |
| Summary   | items_per_watch                         | API watch        |
| Gauge     | last_resource_version                   | resource version |
| Histogram | ovs_client_request_latency_milliseconds | OVN              |
| Gauge     | subnet_available_ip_count               | IP               |
| Gauge     | subnet_used_ip_count                    | IP               |

## 8.10.5 kube-ovn-cni

`kube-ovn-cni`

| Histogram | cni_op_latency_seconds                  | CNI              |
|-----------|---|------------------|
| Counter   | cni_wait_address_seconds_total          | CNI              |
| Counter   | cni_wait_connectivity_seconds_total     | CNI              |
| Counter   | cni_wait_route_seconds_total            | CNI              |
| Histogram | rest_client_request_latency_seconds     | apiserver        |
| Counter   | rest_client_requests_total              | apiserver        |
| Counter   | lists_total                             | API list         |
| Summary   | list_duration_seconds                   | API list         |
| Summary   | items_per_list                          | API list         |
| Counter   | watches_total                           | API watch        |
| Counter   | short_watches_total                     | API watch        |
| Summary   | watch_duration_seconds                  | API watch        |
| Summary   | items_per_watch                         | API watch        |
| Gauge     | last_resource_version                   | resource version |
| Histogram | ovs_client_request_latency_milliseconds | OVN              |



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8.10.6

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## 8.11 Kube-OVN

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Kube-OVN      Kube-OVN      CRD      CRD

### 8.11.1 Condition

|                    |        |      |       |         |
|--------------------|--------|------|-------|---------|
| type               | String |      |       |         |
| status             | String | True | False | Unknown |
| reason             | String |      |       |         |
| message            | String |      |       |         |
| observedGeneration | Int64  |      |       |         |
| lastUpdateTime     | Time   |      |       |         |
| lastTransitionTime | Time   |      |       |         |

CRD      Status      Condition

### 8.11.2

#### Subnet

SUBNET

|            |              |            |               |
|------------|--------------|------------|---------------|
| apiVersion | String       | Kubernetes | kubeovn.io/v1 |
| kind       | String       | Kubernetes | Subnet        |
| metadata   | ObjectMeta   | Kubernetes |               |
| spec       | SubnetSpec   | Subnet     |               |
| status     | SubnetStatus | Subnet     |               |

**SubnetSpec**

|                        |                         |                  |                             |                 |              |
|------------------------|-------------------------|------------------|-----------------------------|-----------------|--------------|
| default                | Bool                    |                  |                             |                 |              |
| vpc                    | String                  | VPC              | ovn-cluster                 |                 |              |
| protocol               | String                  | IP               | IPv4                        | IPv6            | Dual         |
| namespaces             | []String                |                  | namespace                   |                 |              |
| cidrBlock              | String                  |                  | 10.16.0.0/16                |                 |              |
| gateway                | String                  |                  | CIDRBlock                   |                 |              |
| excludelps             | []String                |                  |                             |                 |              |
| provider               | String                  | OVN Subnet       | NetworkAttachmentDefinition | . Kube-OVN      |              |
| gatewayType            | String                  | Overlay          | distributed                 | centralized     |              |
| gatewayNode            | String                  |                  | centralized                 |                 |              |
| natOutgoing            | Bool                    | NAT              | externalEgressGateway       |                 |              |
| externalEgressGateway  | String                  |                  | natOutgoing                 |                 |              |
| policyRoutingPriority  | Uint32                  |                  |                             |                 |              |
| policyRoutingTableID   | Uint32                  |                  | TableID                     |                 |              |
| mtu                    | Uint32                  |                  | MTU                         |                 |              |
| private                | Bool                    |                  |                             |                 |              |
| allowSubnets           | []String                |                  |                             |                 |              |
| vlan                   | String                  |                  | Vlan                        |                 |              |
| vips                   | []String                | virtual          | Isp                         | virtual-ip      |              |
| logicalGateway         | Bool                    |                  |                             |                 |              |
| disableGatewayCheck    | Bool                    |                  | Pod                         |                 |              |
| disableInterConnection | Bool                    |                  |                             |                 |              |
| enableDHCP             | Bool                    |                  | Isp                         | dhcp            |              |
| dhcpV4Options          | String                  |                  | Isp                         | dhcpv4_options  | DHCP_Options |
| dhcpV6Options          | String                  |                  | Isp                         | dhcpv6_options  | DHCP_Options |
| enableIPv6RA           | Bool                    |                  | Irp                         | ipv6_ra_configs |              |
| ipv6RAConfigs          | String                  |                  | Irp                         | ipv6_ra_configs |              |
| acls                   | []Acl                   |                  | logical-switch              | acls            |              |
| allowEWTraffic         | Bool                    |                  |                             |                 |              |
| natOutgoingPolicyRules | []NatOutgoingPolicyRule | NAT              |                             |                 |              |
| u2oInterconnectionIP   | String                  | Underlay/Overlay | IP                          |                 |              |
| u2oInterconnection     | Bool                    | Overlay/Underlay |                             |                 |              |
| enableLb               | *Bool                   | logical-switch   | load-balancer               |                 |              |
| enableEcmp             | Bool                    | ECMP             |                             |                 |              |

|                         |                 |
|-------------------------|-----------------|
| enableMulticastSnoop    | Bool            |
| enableExternalLBAddress | Bool            |
| routeTable              | String          |
| namespaceSelectors      | []LabelSelector |

**Acl**

|           |        |     |               |                 |
|-----------|--------|-----|---------------|-----------------|
| direction | String | Acl | from-lport    | to-lport        |
| priority  | Int    | Acl | 0             | 32767           |
| match     | String | Acl |               |                 |
| action    | String | Acl | allow-related | allow-stateless |
|           |        |     | allow         | drop            |
|           |        |     | reject        |                 |

**NatOutgoingPolicyRule**

|        |                        |
|--------|------------------------|
| match  | NatOutGoingPolicyMatch |
| action | String                 |

**NatOutGoingPolicyMatch**

|        |        |    |
|--------|--------|----|
| srcIPs | String | IP |
| dstIPs | String | IP |

## SubnetStatus

| conditions             | >[]SubnetCondition            | Condition          |              |
|------------------------|-------------------------------|--------------------|--------------|
| v4availableIPs         | Float64                       | IPv4 IP            |              |
| v4availableIPrange     | String                        | IPv4               |              |
| v4usingIPs             | Float64                       | IPv4 IP            |              |
| v4usingIPrange         | String                        | IPv4               |              |
| v6availableIPs         | Float64                       | IPv6 IP            |              |
| v6availableIPrange     | String                        | IPv6               |              |
| v6usingIPs             | Float64                       | IPv6 IP            |              |
| v6usingIPrange         | String                        | IPv6               |              |
| activateGateway        | String                        |                    |              |
| dhcpV4OptionsUUID      | String                        | lsp dhcpv4_options | DHCP_Options |
| dhcpV6OptionsUUID      | String                        | lsp dhcpv6_options | DHCP_Options |
| u2oInterconnectionIP   | String                        | Overlay/Underlay   | IP           |
| u2oInterconnectionMAC  | String                        | Overlay/Underlay   | MAC          |
| u2oInterconnectionVPC  | String                        | Overlay/Underlay   | VPC          |
| natOutgoingPolicyRules | []NatOutgoingPolicyRuleStatus | NAT                |              |
| mcastQuerierIP         | String                        | IP                 |              |
| mcastQuerierMAC        | String                        | MAC                |              |

## IP

## IP

|            |            |            |               |
|------------|------------|------------|---------------|
| apiVersion | String     | Kubernetes | kubeovn.io/v1 |
| kind       | String     | Kubernetes | IP            |
| metadata   | ObjectMeta | Kubernetes |               |
| spec       | IPSpec     | IP         |               |

**IPSpec**

| IPSpec        |          |                                |              |
|---------------|----------|--------------------------------|--------------|
| podName       | String   | Pod                            |              |
| namespace     | String   | Pod Namespace                  |              |
| subnet        | String   | IP Subnet                      |              |
| attachSubnets | []String | IP                             |              |
| nodeName      | String   | Pod                            |              |
| ipAddress     | String   | IP                             | v4IP v6IP    |
| v4IpAddress   | String   | IPv4 IP                        |              |
| v6IpAddress   | String   | IPv6 IP                        |              |
| attachIps     | []String | IP                             | IP           |
| macAddress    | String   | Pod                            | MAC          |
| attachMacs    | []String | IP                             | MAC          |
| containerID   | String   | Pod                            | Container ID |
| podType       | String   | Pod StatefulSet VirtualMachine |              |

**Vpc**

## VPC

| VPC        |            |            |               |
|------------|------------|------------|---------------|
| apiVersion | String     | Kubernetes | kubeovn.io/v1 |
| kind       | String     | Kubernetes | Vpc           |
| metadata   | ObjectMeta | Kubernetes |               |
| spec       | VpcSpec    | Vpc        |               |
| status     | VpcStatus  | Vpc        |               |

## VpcSpec

| VpcSpec              |               |         |  |
|----------------------|---------------|---------|--|
| defaultSubnet        | String        |         |  |
| namespaces           | []String      | Vpc     |  |
| staticRoutes         | []StaticRoute |         |  |
| policyRoutes         | []PolicyRoute |         |  |
| vpcPeerings          | []VpcPeering  | VPC     |  |
| enableExternal       | Bool          |         |  |
| extraExternalSubnets | []String      |         |  |
| enableBfd            | Bool          | BFD ( ) |  |
| bfdPort              | BFDPort       | BFD     |  |

## StaticRoute

|            |        |        |
|------------|--------|--------|
| policy     | String |        |
| cidr       | String |        |
| nextHopIP  | String | IP     |
| ecmpMode   | String | ECMP   |
| bfdId      | String | BFD ID |
| routeTable | String |        |

## PolicyRoute

|           |        |                    |
|-----------|--------|--------------------|
| priority  | Int    |                    |
| match     | String |                    |
| action    | String | allow drop reroute |
| nextHopIP | String | IP action reroute  |

## VpcPeering

|                |        |     |
|----------------|--------|-----|
| remoteVpc      | String | VPC |
| localConnectIP | String | IP  |

## BFDPort

|              |               |         |
|--------------|---------------|---------|
| enabled      | Bool          | BFD     |
| ip           | String        | BFD IP  |
| nodeSelector | LabelSelector | BFD LRP |

**VpcStatus**

| conditions              | IVpcCondition | Vpc  | Condition |
|-------------------------|---------------|------|-----------|
| standby                 | Bool          | VPC  |           |
| default                 | Bool          | VPC  |           |
| defaultLogicalSwitch    | String        |      |           |
| router                  | String        |      |           |
| tcpLoadBalancer         | String        | TCP  |           |
| udpLoadBalancer         | String        | UDP  |           |
| sctpLoadBalancer        | String        | SCTP |           |
| tcpSessionLoadBalancer  | String        | TCP  |           |
| udpSessionLoadBalancer  | String        | UDP  |           |
| sctpSessionLoadBalancer | String        | SCTP |           |
| subnets                 | IString       | VPC  |           |
| vpcPeerings             | IString       | VPC  |           |
| enableExternal          | Bool          |      |           |
| extraExternalSubnets    | IString       |      |           |
| enableBfd               | Bool          | BFD  |           |

**8.11.3 Underlay****Vlan**

|            |            |            |               |
|------------|------------|------------|---------------|
| apiVersion | String     | Kubernetes | kubeovn.io/v1 |
| kind       | String     | Kubernetes | Vlan          |
| metadata   | ObjectMeta | Kubernetes |               |
| spec       | VlanSpec   | Vlan       |               |
| status     | VlanStatus | Vlan       |               |

**VLANSPEC**

|          |        |          |                 |
|----------|--------|----------|-----------------|
| id       | Int    | Vlan tag | 0~4096          |
| provider | String | Vlan     | ProviderNetwork |

**VLANSTATUS**

|            |                 |      |           |
|------------|-----------------|------|-----------|
| subnets    | []String        | Vlan |           |
| conflict   | Bool            |      |           |
| conditions | []VlanCondition | Vlan | Condition |

**ProviderNetwork**

|            |                       |                 |                 |
|------------|-----------------------|-----------------|-----------------|
| apiVersion | String                | Kubernetes      | kubeovn.io/v1   |
| kind       | String                | Kubernetes      | ProviderNetwork |
| metadata   | ObjectMeta            | Kubernetes      |                 |
| spec       | ProviderNetworkSpec   | ProviderNetwork |                 |
| status     | ProviderNetworkStatus | ProviderNetwork |                 |

**PROVIDERNETWORKSPEC**

|                  |                   |     |             |                  |                           |
|------------------|-------------------|-----|-------------|------------------|---------------------------|
| defaultInterface | String            |     |             |                  |                           |
| customInterfaces | []CustomInterface |     |             |                  |                           |
| nodeSelector     | LabelSelector     | OVS | matchLabels | matchExpressions | nodeSelector excludeNodes |
| excludeNodes     | []String          |     |             |                  |                           |
| exchangeLinkName | Bool              | OVS |             |                  |                           |

**CustomInterface**

|           |          |          |
|-----------|----------|----------|
| interface | String   | Underlay |
| nodes     | []String |          |

**PROVIDERNETWORKSTATUS**

|               |                            |                 |           |
|---------------|----------------------------|-----------------|-----------|
| ready         | Bool                       |                 |           |
| readyNodes    | []String                   |                 |           |
| notReadyNodes | []String                   |                 |           |
| vlans         | []String                   | Vlan            |           |
| conditions    | []ProviderNetworkCondition | ProviderNetwork | Condition |

## 8.11.4

### SecurityGroup

|            |                     |               |               |
|------------|---------------------|---------------|---------------|
| apiVersion | String              | Kubernetes    | kubeovn.io/v1 |
| kind       | String              | Kubernetes    | SecurityGroup |
| metadata   | ObjectMeta          | Kubernetes    |               |
| spec       | SecurityGroupSpec   | SecurityGroup |               |
| status     | SecurityGroupStatus | SecurityGroup |               |

### SECURITYGROUPSPEC

|                       |                     |
|-----------------------|---------------------|
| ingressRules          | []SecurityGroupRule |
| egressRules           | []SecurityGroupRule |
| allowSameGroupTraffic | Bool                |

### SecurityGroupRule

|                     |              |    |         |               |     |     |
|---------------------|--------------|----|---------|---------------|-----|-----|
| ipVersion           | String       | IP | ipv4    | ipv6          |     |     |
| protocol            | SgProtocol   |    | all     | icmp          | tcp | udp |
| priority            | Int          |    | 1-200   |               |     |     |
| remoteType          | SgRemoteType |    | address | securityGroup |     |     |
| remoteAddress       | String       |    |         |               |     |     |
| remoteSecurityGroup | String       |    |         |               |     |     |
| portRangeMin        | Int          |    | 1       |               |     |     |
| portRangeMax        | Int          |    | 65535   |               |     |     |
| policy              | SgPolicy     |    | allow   | drop          |     |     |

### SECURITYGROUPSTATUS

|                        |        |     |
|------------------------|--------|-----|
| portGroup              | String |     |
| allowSameGroupTraffic  | Bool   |     |
| ingressMd5             | String | MD5 |
| egressMd5              | String | MD5 |
| ingressLastSyncSuccess | Bool   |     |
| egressLastSyncSuccess  | Bool   |     |

## 8.11.5 IP

### Vip

|            |            |            |               |
|------------|------------|------------|---------------|
| apiVersion | String     | Kubernetes | kubeovn.io/v1 |
| kind       | String     | Kubernetes | Vip           |
| metadata   | ObjectMeta | Kubernetes |               |
| spec       | VipSpec    | Vip        |               |
| status     | VipStatus  | Vip        |               |

### VIPSPEC

|               |          |      |
|---------------|----------|------|
| namespace     | String   | VIP  |
| subnet        | String   | VIP  |
| type          | String   | VIP  |
| v4ip          | String   | IPv4 |
| v6ip          | String   | IPv6 |
| macAddress    | String   | MAC  |
| selector      | []String |      |
| attachSubnets | []String |      |

### VIPSTATUS

|            |                |      |           |
|------------|----------------|------|-----------|
| conditions | []VipCondition | VIP  | Condition |
| type       | String         | VIP  |           |
| v4ip       | String         | IPv4 |           |
| v6ip       | String         | IPv6 |           |
| mac        | String         | MAC  |           |

### SwitchLBRule

|            |                    |              |               |
|------------|--------------------|--------------|---------------|
| apiVersion | String             | Kubernetes   | kubeovn.io/v1 |
| kind       | String             | Kubernetes   | SwitchLBRule  |
| metadata   | ObjectMeta         | Kubernetes   |               |
| spec       | SwitchLBRuleSpec   | SwitchLBRule |               |
| status     | SwitchLBRuleStatus | SwitchLBRule |               |

**SWITCHLBRULESPEC**

|                 |                    |    |
|-----------------|--------------------|----|
| vip             | String             | IP |
| namespace       | String             |    |
| selector        | []String           |    |
| endpoints       | []String           |    |
| sessionAffinity | String             |    |
| ports           | []SwitchLBRulePort |    |

**SwitchLBRulePort**

|            |        |
|------------|--------|
| name       | String |
| port       | Int32  |
| targetPort | Int32  |
| protocol   | String |

**SWITCHLBRULESTATUS**

|            |                         |              |           |
|------------|-------------------------|--------------|-----------|
| conditions | []SwitchLBRuleCondition | SwitchLBRule | Condition |
| ports      | String                  | SwitchLBRule |           |
| service    | String                  | SwitchLBRule | service   |

---

**8.11.6 QoS IP****QoS Policy**

|            |                 |            |               |
|------------|-----------------|------------|---------------|
| apiVersion | String          | Kubernetes | kubeovn.io/v1 |
| kind       | String          | Kubernetes | QoS Policy    |
| metadata   | ObjectMeta      | Kubernetes |               |
| spec       | QoS Policy Spec | QoS Policy |               |

**QOSPOLICYSPEC**

|                     |                                  |
|---------------------|----------------------------------|
| bandwidthLimitRules | QoS Policy Bandwidth Limit Rules |
| shared              | Bool                             |
| bindingType         | QoS Policy Binding Type          |

**IPPool**

| apiVersion | String       | Kubernetes | kubeovn.io/v1 |
|------------|--------------|------------|---------------|
| kind       | String       | Kubernetes | IPPool        |
| metadata   | ObjectMeta   | Kubernetes |               |
| spec       | IPPoolSpec   | IPPool     |               |
| status     | IPPoolStatus | IPPool     |               |

**IPPOOLSPEC**

| subnet     | String   |    |  |
|------------|----------|----|--|
| namespaces | []String |    |  |
| ips        | []String | IP |  |

**IPPOOLSTATUS**

| v4AvailableIPs     | BigInt            | IPv4 | IP        |
|--------------------|-------------------|------|-----------|
| v4AvailableIPRange | String            | IPv4 | IP        |
| v4UsingIPs         | BigInt            | IPv4 | IP        |
| v4UsingIPRange     | String            | IPv4 | IP        |
| v6AvailableIPs     | BigInt            | IPv6 | IP        |
| v6AvailableIPRange | String            | IPv6 | IP        |
| v6UsingIPs         | BigInt            | IPv6 | IP        |
| v6UsingIPRange     | String            | IPv6 | IP        |
| conditions         | []IPPoolCondition | IP   | Condition |

## 8.11.7 NAT IP

**IptablesEIP**

| apiVersion | String            | Kubernetes  | kubeovn.io/v1 |
|------------|-------------------|-------------|---------------|
| kind       | String            | Kubernetes  | IptablesEIP   |
| metadata   | ObjectMeta        | Kubernetes  |               |
| spec       | IptablesEIPSpec   | IptablesEIP |               |
| status     | IptablesEIPStatus | IptablesEIP |               |

## IPTABLESEIPSPEC

| v4ip           | String | IPv4 |
|----------------|--------|------|
| v6ip           | String | IPv6 |
| macAddress     | String | MAC  |
| natGwDp        | String | NAT  |
| qosPolicy      | String | QoS  |
| externalSubnet | String |      |

## IPTABLESEIPSTATUS

| ready      | Bool                   | IptablesEIP |     |           |      |
|------------|------------------------|-------------|-----|-----------|------|
| ip         | String                 | IptablesEIP | IP  | IPv4      |      |
| redo       | String                 | IptablesEIP | CRD |           |      |
| nat        | String                 | IptablesEIP | fip | snat      | dnat |
| qosPolicy  | String                 | QoS         |     |           |      |
| conditions | []IptablesEIPCondition | IptablesEIP |     | Condition |      |

## OvnEip

| apiVersion | String       | Kubernetes | kubeovn.io/v1 |
|------------|--------------|------------|---------------|
| kind       | String       | Kubernetes | OvnEip        |
| metadata   | ObjectMeta   | Kubernetes |               |
| spec       | OvnEipSpec   | OvnEip     |               |
| status     | OvnEipStatus | OvnEip     |               |

## OVNEIPSPEC

| externalSubnet | String |             |
|----------------|--------|-------------|
| v4Ip           | String | IPv4        |
| v6Ip           | String | IPv6        |
| macAddress     | String | MAC         |
| type           | String | lrp lsp nat |

**IptablesFIPRule**

|            |                     |                 |                 |
|------------|---------------------|-----------------|-----------------|
| apiVersion | String              | Kubernetes      | kubeovn.io/v1   |
| kind       | String              | Kubernetes      | IptablesFIPRule |
| metadata   | ObjectMeta          | Kubernetes      |                 |
| spec       | IptablesFIPRuleSpec | IptablesFIPRule |                 |

## IPTABLESFIPRULESPEC

|            |        |    |
|------------|--------|----|
| eip        | String | IP |
| internalIP | String | IP |

**OvnFip**

|            |              |            |               |
|------------|--------------|------------|---------------|
| apiVersion | String       | Kubernetes | kubeovn.io/v1 |
| kind       | String       | Kubernetes | OvnFip        |
| metadata   | ObjectMeta   | Kubernetes |               |
| spec       | OvnFipSpec   | OvnFip     |               |
| status     | OvnFipStatus | OvnFip     |               |

## OVNFIPSPEC

|        |        |             |             |
|--------|--------|-------------|-------------|
| ovnEip | String | OVN EIP     |             |
| ipType | String | IP          | vip ip      |
| ipName | String | IP          |             |
| vpc    | String | VPC         |             |
| v4Ip   | String | IPv4        |             |
| v6Ip   | String | IPv6        |             |
| type   | String | distributed | centralized |

**IptablesDnatRule**

|            |                      |                  |                  |
|------------|----------------------|------------------|------------------|
| apiVersion | String               | Kubernetes       | kubeovn.io/v1    |
| kind       | String               | Kubernetes       | IptablesDnatRule |
| metadata   | ObjectMeta           | Kubernetes       |                  |
| spec       | IptablesDnatRuleSpec | IptablesDnatRule |                  |

## IPTABLESDNATRULESPEC

|              |        |    |
|--------------|--------|----|
|              |        |    |
| eip          | String | IP |
| externalPort | String |    |
| protocol     | String |    |
| internalIP   | String | IP |
| internalPort | String |    |

## OvnDnatRule

|            |                   |             |               |
|------------|-------------------|-------------|---------------|
|            |                   |             |               |
| apiVersion | String            | Kubernetes  | kubeovn.io/v1 |
| kind       | String            | Kubernetes  | OvnDnatRule   |
| metadata   | ObjectMeta        | Kubernetes  |               |
| spec       | OvnDnatRuleSpec   | OvnDnatRule |               |
| status     | OvnDnatRuleStatus | OvnDnatRule |               |

## OVNDNATRULESPEC

|              |        |           |
|--------------|--------|-----------|
|              |        |           |
| ovnEip       | String | OVN EIP   |
| ipType       | String | IP vip ip |
| ipName       | String | IP        |
| internalPort | String |           |
| externalPort | String |           |
| protocol     | String |           |
| vpc          | String | VPC       |
| v4Ip         | String | IPv4      |
| v6Ip         | String | IPv6      |

**OVNDNATRULESTATUS**

| vpc          | String                 | VPC      |           |
|--------------|------------------------|----------|-----------|
| v4Eip        | String                 | IPv4 EIP |           |
| v6Eip        | String                 | IPv6 EIP |           |
| externalPort | String                 |          |           |
| v4Ip         | String                 | IPv4     |           |
| v6Ip         | String                 | IPv6     |           |
| internalPort | String                 |          |           |
| protocol     | String                 |          |           |
| ipName       | String                 | IP       |           |
| ready        | Bool                   | DNAT     |           |
| conditions   | []OvnDnatRuleCondition | OVN DNAT | Condition |

**IptablesSnatRule**

| apiVersion | String               | Kubernetes       | kubeovn.io/v1    |
|------------|----------------------|------------------|------------------|
| kind       | String               | Kubernetes       | IptablesSnatRule |
| metadata   | ObjectMeta           | Kubernetes       |                  |
| spec       | IptablesSnatRuleSpec | IptablesSnatRule |                  |

**IPTABLESSNATRULESPEC**

| eip          | String | IP   |
|--------------|--------|------|
| internalCIDR | String | CIDR |

**OvnSnatRule**

| apiVersion | String            | Kubernetes  | kubeovn.io/v1 |
|------------|-------------------|-------------|---------------|
| kind       | String            | Kubernetes  | OvnSnatRule   |
| metadata   | ObjectMeta        | Kubernetes  |               |
| spec       | OvnSnatRuleSpec   | OvnSnatRule |               |
| status     | OvnSnatRuleStatus | OvnSnatRule |               |

## OVNSNATRULESPEC

| ovnEip    | String | OVN EIP   |
|-----------|--------|-----------|
| vpcSubnet | String | VPC       |
| ipName    | String | IP        |
| vpc       | String | VPC       |
| v4IpCidr  | String | IPv4 CIDR |
| v6IpCidr  | String | IPv6 CIDR |

## 8.11.8 VPC

## VpcNatGateway

| apiVersion | String              | Kubernetes    | kubeovn.io/v1 |  |
|------------|---------------------|---------------|---------------|--|
| kind       | String              | Kubernetes    | VpcNatGateway |  |
| metadata   | ObjectMeta          | Kubernetes    |               |  |
| spec       | VpcNatGatewaySpec   | VpcNatGateway |               |  |
| status     | VpcNatGatewayStatus | VpcNatGateway |               |  |

## VPCNATGATEWAYSPEC

| vpc             | String        | VPC                 | Pod | VPC |
|-----------------|---------------|---------------------|-----|-----|
| subnet          | String        | VPC                 | Pod |     |
| externalSubnets | []String      |                     |     |     |
| lanIp           | String        | VPC                 | Pod | IP  |
| selector        | []String      | Kubernetes Selector |     |     |
| tolerations     | []Toleration  | Kubernetes          |     |     |
| affinity        | Affinity      | Kubernetes          |     |     |
| qosPolicy       | String        | QoS                 |     |     |
| bgpSpeaker      | VpcBgpSpeaker | BGP speaker         |     |     |
| routes          | []Route       |                     |     |     |

**VpcBgpSpeaker**

| enabled               | Bool     | BGP speaker |
|-----------------------|----------|-------------|
| asn                   | Uint32   |             |
| remoteAsn             | Uint32   |             |
| neighbors             | IString  | BGP         |
| holdTime              | Duration | BGP         |
| routerId              | String   | BGP ID      |
| password              | String   | BGP         |
| enableGracefulRestart | Bool     |             |
| extraArgs             | IString  |             |

**Route**

| cidr      | String | CIDR |
|-----------|--------|------|
| nextHopIP | String | IP   |

**VPCNATGATEWAYSTATUS**

| qosPolicy       | String      | QoS                 |
|-----------------|-------------|---------------------|
| externalSubnets | IString     |                     |
| selector        | IString     | Kubernetes Selector |
| tolerations     | IToleration | Kubernetes          |
| affinity        | Affinity    | Kubernetes          |

**VpcEgressGateway**

| apiVersion | String                 | Kubernetes       | kubeovn.io/v1    |
|------------|------------------------|------------------|------------------|
| kind       | String                 | Kubernetes       | VpcEgressGateway |
| metadata   | ObjectMeta             | Kubernetes       |                  |
| spec       | VpcEgressGatewaySpec   | VpcEgressGateway |                  |
| status     | VpcEgressGatewayStatus | VpcEgressGateway |                  |

## VPCEGRESSGATEWAYSPEC

| vpc            | String   | VPC |
|----------------|----------|-----|
| replicas       | Int32    |     |
| prefix         | String   |     |
| image          | String   |     |
| internalSubnet | String   |     |
| externalSubnet | String   |     |
| internalIPs    | []String | IP  |
| externalIPs    | []String | IP  |
| trafficPolicy  | String   |     |

## VpcDns

| apiVersion | String       | Kubernetes | kubeovn.io/v1 |
|------------|--------------|------------|---------------|
| kind       | String       | Kubernetes | VpcDns        |
| metadata   | ObjectMeta   | Kubernetes |               |
| spec       | VpcDNSSpec   | VpcDns     |               |
| status     | VpcDNSStatus | VpcDns     |               |

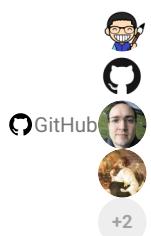
## VPCDNSSPEC

| replicas | Int32  |     |
|----------|--------|-----|
| vpc      | String | VPC |
| subnet   | String |     |



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## 8.11.9

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## 8.12 Annotation

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| Kube-OVN | Pod | Node Annotation | Annotation |
|----------|-----|-----------------|------------|
|          |     |                 | Annotation |

### 8.12.1 Pod Annotation

| Key                                   | Value                | Description |   |            |            |     |  |  |  |  |  |  |  |  |
|---------------------------------------|----------------------|-------------|---|------------|------------|-----|--|--|--|--|--|--|--|--|
| ovn.kubernetes.io/allocated           | true or false        | Pod         |   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/routed              | true or false        | Pod         | OVN                                       |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/routes              | String               | Pod         |   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/mac_address         | String               | Pod         | Mac                                       | Pod        | Annotation | Mac |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/ip_address          | String               | Pod         | IP  | Pod        | Annotation | IP  |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/cidr                | String               | Pod         | CIDR                                      |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/gateway             | String               | Pod         | Gateway                                   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/ip_pool             | IP                   | Pod         | Workload                                  |            | IP         |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/bgp                 | true, cluster, local | BGP         | Pod                                       |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/snat                | String               | Pod         | SNAT                                      |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/eip                 | String               | Pod         | EIP                                       |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/vip                 | String               | Pod         | VIP                                       | Annotation | Annotation | VIP |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/aaps                | String               | Pod         | AAPs (Additional Allowed Addresses Pairs) |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/virtualmachine      | String               | Pod         | VirtualMachineInstance                    |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/activation_strategy | String               | Pod         |   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/logical_router      | String               | Pod         | VPC                                       |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/layer2_forward      | true or false        | Pod         | OVN LSP                                   | unknown    |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/port_security       | true or false        | Pod         | Port Security                             |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/logical_switch      | String               | Pod         |   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/vlan_id             | Int                  | Pod         | Vlan ID                                   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/ingress_rate        | Int                  | Pod         | Mbits/s                                   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/egress_rate         | Int                  | Pod         | Mbits/s                                   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/security_groups     | String               | Pod         | Security Group                            |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/default_route       | true or false        |             |   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/provider_network    | String               | Pod         | ProviderNetwork                           |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/mirror              | true or false        | Pod         |   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/north_gateway       | String               | Pod         |   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/latency             | Int                  | Pod         | ms  |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/limit               | Int                  | Pod         | qdisc                                     |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/loss                | Float                | Pod         |   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/jitter              | Int                  | Pod         | ms  |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/generate-hash       | true or false        | Pod         |   |            |            |     |  |  |  |  |  |  |  |  |
| ovn.kubernetes.io/attachmentprovider  | String               | Pod         |   |            |            |     |  |  |  |  |  |  |  |  |

## 8.12.2 Node Annotation

| Key                                | Value         | Description           |                  |         |
|------------------------------------|---------------|-----------------------|------------------|---------|
| ovn.kubernetes.io/allocated        | true or false | ovn0                  | join             |         |
| ovn.kubernetes.io/mac_address      | String        | Node ovn0             | Mac              |         |
| ovn.kubernetes.io/ip_address       | String        | Node ovn0             | IP               |         |
| ovn.kubernetes.io/cidr             | String        | Node ovn0             | join             | CIDR    |
| ovn.kubernetes.io/gateway          | String        | Node ovn0             | join             | Gateway |
| ovn.kubernetes.io/chassis          | String        | Node OVN-SouthBoundDB | Chassis ID       |         |
| ovn.kubernetes.io/port_name        | String        | Node ovn0             | OVN-NorthboundDB | LSP     |
| ovn.kubernetes.io/logical_switch   | String        | Node ovn0             |                  |         |
| ovn.kubernetes.io/tunnel_interface | String        |                       |                  |         |

## 8.12.3 Namespace Annotation

| Key                           | Value      | Description |            |
|-------------------------------|------------|-------------|------------|
| ovn.kubernetes.io/cidr        | CIDR       | Namespace   | CIDR       |
| ovn.kubernetes.io/exclude_ips | excludelPs | Namespace   | excludelPs |

## 8.12.4 Subnet Annotation

| Key                   | Value                | Description |
|-----------------------|----------------------|-------------|
| ovn.kubernetes.io/bgp | true, cluster, local | BGP         |

## 8.12.5 Service Annotation

| Key   | Value         | Description |          |     |
|---|---------------|-------------|----------|-----|
| ovn.kubernetes.io/bgp                             | true or false | BGP         | Service  |     |
| ovn.kubernetes.io/switch_lb_vip                   | String        | Service     | Kube-OVN | VIP |
| ovn.kubernetes.io/vpc                             | String        | Service     | VPC      |     |
| ovn.kubernetes.io/service_external_ip_from_subnet | true or false | Service     | IP       |     |
| ovn.kubernetes.io/service_health_check            | true or false | Service     |          |     |
| ovn.kubernetes.io/lb_svc_img                      | String        |             |          |     |

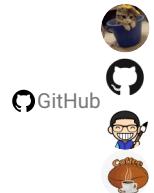
## 8.12.6 Networkpolicy Annotation

| Key                                  | Value             | Description   |   |
|--------------------------------------|-------------------|---------------|---|
| ovn.kubernetes.io/enable_log         | true or false     | NetworkPolicy |   |
| ovn.kubernetes.io/log_acl_actions    | "allow,drop,pass" | Action ACL    |   |
| ovn.kubernetes.io/acl_log_meter_rate | Int               | NetworkPolicy | / |



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8.12.7

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## 8.13

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### 8.13.1

| Bad | Good |
|-----|------|
|     |      |

| Bad      | Good          |
|----------|---------------|
| Kube-OVN | 1.10 Kube-OVN |

  ■ ■

| Bad            | Good           |
|----------------|----------------|
| wget 127.0.0.1 | wget 127.0.0.1 |

### 8.13.2

yaml        yaml

| Bad   | Good  |
|---|---|
| ....<br>apiVersion: kubeovn.io/v1<br>kind: Subnet<br>metadata:<br>name: attach-subnet<br>.... | ....yaml<br>apiVersion: kubeovn.io/v1<br>kind: Subnet<br>metadata:<br>name: attach-subnet<br>.... |

bash

| Bad                            | Good                               |
|--------------------------------|------------------------------------|
| ....<br>wget 127.0.0.1<br>.... | ....bash<br>wget 127.0.0.1<br>.... |

| Bad  | Good  |
|--|---|
| <pre># oilbeater@macdeMac-3 ~ ping 114.114.114.114 -c 3 PING 114.114.114.114 (114.114.114.114): 56 data bytes 64 bytes from 114.114.114.114: icmp_seq=0 ttl=83 time=10.429 ms 64 bytes from 114.114.114.114: icmp_seq=1 ttl=79 time=11.360 ms 64 bytes from 114.114.114.114: icmp_seq=2 ttl=76 time=10.794 ms  --- 114.114.114.114 ping statistics --- 3 packets transmitted, 3 packets received, 0.0% packet loss round-trip min/avg/max/stddev = 10.429/10.861/11.360/0.383 ms</pre> | <pre># ping 114.114.114.114 -c 3 PING 114.114.114.114 (114.114.114.114): 56 data bytes 64 bytes from 114.114.114.114: icmp_seq=0 ttl=83 time=10.429 ms 64 bytes from 114.114.114.114: icmp_seq=1 ttl=79 time=11.360 ms 64 bytes from 114.114.114.114: icmp_seq=2 ttl=76 time=10.794 ms  --- 114.114.114.114 ping statistics --- 3 packets transmitted, 3 packets received, 0.0% packet loss round-trip min/avg/max/stddev = 10.429/10.861/11.360/0.383 ms</pre> |

| Bad  | Good   |
|--|--|
| <pre># mv /etc/origin/ovn/ovnnb_db.db /tmp # mv /etc/origin/ovn/ovnsb_db.db /tmp</pre> | <pre>mv /etc/origin/ovn/ovnnb_db.db /tmp mv /etc/origin/ovn/ovnsb_db.db /tmp</pre> |

### 8.13.3

md

| Bad  | Good                         |
|--|------------------------------|
| <pre>[ ](http://kubeovn.github.io/prepare)</pre> | <pre>[ ](./prepare.md)</pre> |

| Bad  | Good   |
|--|--|
| <pre>[Kubernetes] (http://kubernetes.io)</pre> | <pre>[Kubernetes] (http://kubernetes.io){: target="_blank" }</pre> |

### 8.13.4

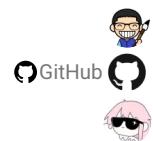
| Bad                                    | Good                                   |
|--|--|
| <pre>```bash wget 127.0.0.1 ``` </pre> | <pre>```bash wget 127.0.0.1 ``` </pre> |

| Bad                                    | Good                                   |
|--|--|
| <pre>```bash wget 127.0.0.1 ``` </pre> | <pre>```bash wget 127.0.0.1 ``` </pre> |



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8.13.5

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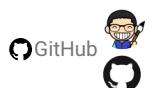
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9.1

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