

Kube-OVN Document

v1.15.0

Kube-OVN Team

2025 Kube-OVN Team

Table of contents

1. Kube-OVN	5
1.1 What is Kube-OVN?	5
1.2 Why Kube-OVN?	5
1.3 CNI	6
1.4 OVN/ovn-kubernetes/Kube-OVN	6
1.5	7
2.	8
2.1	8
2.2	10
2.3 Underlay	12
2.4 CNI	18
2.5 Talos	23
2.6	24
2.7	26
3.	27
3.1	27
3.2	35
3.3 IP	38
3.4	40
3.5 EIP SNAT	41
3.6 QoS	44
3.7	46
3.8 Webhook	47
3.9	49
3.10 LoadBalancer Service	55
3.11	60
3.12	64
4. KubeVirt	71
4.1 VM IP	71
4.2	74
4.3	76
4.4	78
4.5	83
4.6 DHCP	86

5. VPC	87
5.1 VPC	87
5.2 VPC Egress Gateway	96
5.3 VPC QoS	107
5.4 VPC	110
5.5 VPC DNS	114
5.6 SecurityGroup	117
5.7 OVN EIP FIP SNAT DNAT	120
5.8 OVN SNAT ECMP BFD L3 HA	130
5.9 VPC	134
6.	136
6.1 kubectl	136
6.2	146
6.3 ovn-central	148
6.4 OVN	152
6.5 CIDR	154
6.6 Join CIDR	155
6.7	156
6.8	157
7.	161
7.1	161
7.2	168
7.3 FastPath	173
7.4 eBPF TCP	174
7.5 OVN-IC	178
7.6 Submariner	184
7.7 Overlay	186
7.8 Overlay	188
7.9 BGP	191
7.10 MetalLB Kube-OVN Underlay	195
7.11 Cilium	199
7.12 Cilium NetworkPolicy	202
7.13 Cilium	206
7.14	211
7.15 VIP IP	212
7.16 Mellanox Offload	216
7.17 Offload	225
7.18 Offload	229

7.19	Offload	232
7.20	DPDK	235
7.21	OpenStack	239
7.22	IPsec	243
7.23	OVN	244
7.24	DNS Kube-OVN	247
7.25	VPC NAT	249
8.		250
8.1		250
8.2	What's Next	253
8.3		255
8.4		259
8.5	Underlay	261
8.6	Iptables	268
8.7		273
8.8	OVS/OVN	275
8.9		277
8.10	Kube-OVN	279
8.11	Kube-OVN	285
8.12	Annotation	306
8.13		310
9.		313
9.1		313

1. Kube-OVN



1.1 What is Kube-OVN?



1.2 Why Kube-OVN?



1.3 CNI

Kubernetes	CNI		
1.			
2.			
Kube-OVN	CNI	Kube-OVN	Kube-OVN

1.3.1 eBPF

[Cilium](#) Calico eBPF

Kube-OVN Open vSwitch

1.3.2 CNI, Ingress, Service Mesh Observability All in One

Cilium
Kube-OVN CNI

1.3.3 OpenShift

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

1.3.4 Kubernetes EKS/AKS/GKE

Kubernetes	CNI
------------	-----

1.3.5 AI

Hostnetwork [host-device](#)

AI

1.4 OVN/ovn-kubernetes/Kube-OVN

1.4.1 OVN

OVN	Open vSwitch	OpenStack, Kubernetes	CMS	ovn-kubernetes	Kube-OVN	OVN
Kubernetes						

1.4.2 ovn-kubernetes

ovn-kubernetes Acceleration	OVN	OVN	Kubernetes	CNI	OpenShift	OpenShift	UDN, Multihoming, Hardware
--------------------------------	-----	-----	------------	-----	-----------	-----------	----------------------------

1.4.3 Kube-OVN

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

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1.5

2.

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` `iptables_nat` Kube-OVN

1. 3.10.0-862 `netfilter` bug Kube-OVN CentOS bug [Floating IPs broken 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
```

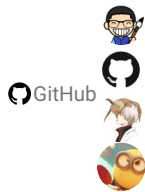
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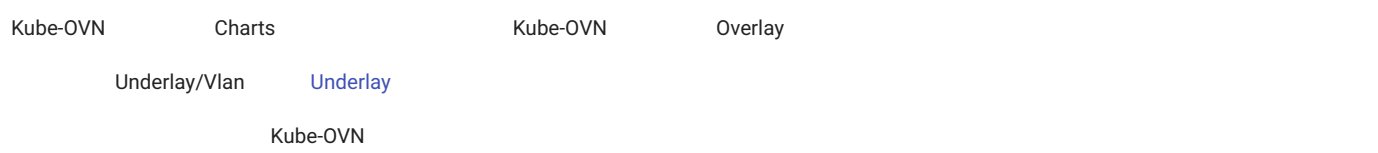
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2.1.4

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="10.16.0/16" # CIDR SVC/NODE/JOIN CIDR
SVC_CIDR="10.96.0/12" # apiserver service-cluster-ip-range
JOIN_CIDR="100.64.0/16" # Pod CIDR SVC/NODE/POD CIDR
LABEL="node-role.kubernetes.io/master" # OVN DB
IFACE="" #
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
kube-ovn-control-plane	NotReady	control-plane
kube-ovn-worker	NotReady	<none>
AGE	VERSION	INTERNAL-IP
20h	v1.26.0	172.18.0.3
20h	v1.26.0	172.18.0.2
EXTERNAL-IP	OS-IMAGE	KERNEL-VERSION
<none>	Ubuntu 22.04.1 LTS	5.10.104-linuxkit
<none>	Ubuntu 22.04.1 LTS	5.10.104-linuxkit
		CONTAINER-RUNTIME
		containerd://1.6.9
		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 -lovn.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 Helming!*
```

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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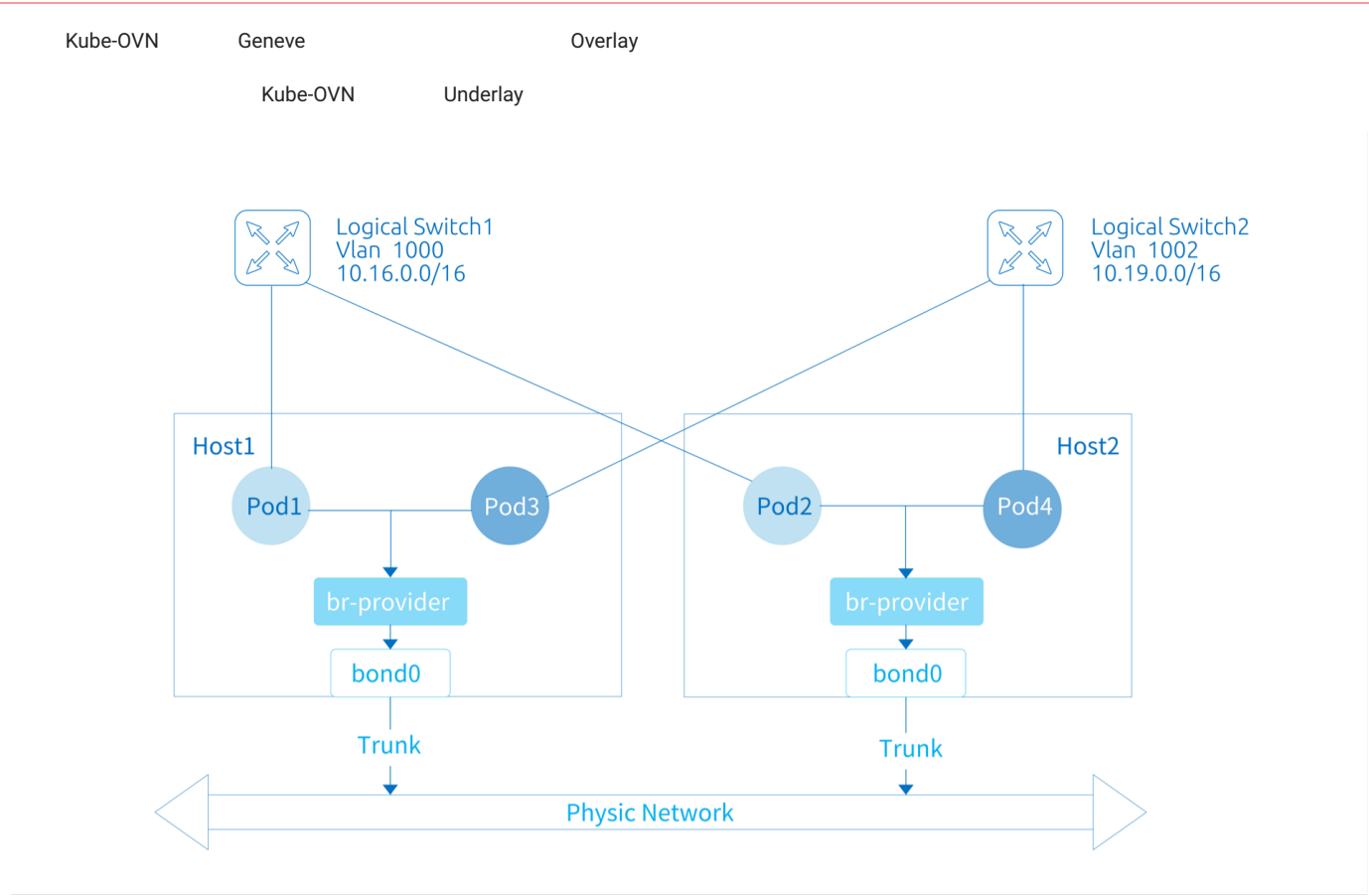






GitHub

2.3 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	OVS Bridge	Underlay	OVS Bridge	br-PROVIDER_NAME
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                   #          IP      192.168.1.1..192.168.1.100
ENABLE_LB                     #  Underlay  Service true
EXCHANGE_LINK_NAME            #  provider-network  OVS      false
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

- defaultInterface: Bond Vlan ProviderNetwork excludeNodes br-net1 br-NAME OVS
- customInterfaces:
- nodeSelector: OVS matchLabels matchExpressions
- excludeNodes: net1.provider-network.ovn.kubernetes.io/exclude=true 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

Overlay

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
<pre>network: renderer: NetworkManager ethernets: eth0: dhcp4: no addresses: - 172.16.143.129/24 version: 2</pre>							
IP	netplan						
<pre>netplan generate nmcli connection reload netplan-eth0 nmcli device set eth0 managed yes</pre>							
Kube-OVN	IP	OVS					
NetworkManager	CentOS						
<pre>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</pre>							
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=00:00:00:25:eb:39,d1_dst=ff: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=00:00:00:25: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=00:00:00:59:ef:13,d1_dst=ff:ff:ff:ff:ff:ff,arp_spa=10.213.152.3,arp_tpa=10.213.159.254,arp_op=1,arp_sha=00:00:00:59:ef:13,arp_tha=ff:ff:ff:ff:ff:ff
```

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

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

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2.3.11

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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 2025 10 30

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2.4.12

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='"172.99.99.0/24"' \
--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
```

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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	Kube-OVN	kubectl bash

2.6.4

Kube-OVN	Kube-OVN	Kube-OVN E2E
----------	----------	--------------

2.6.5

Kube-OVN	OpenTelemetry	DeepFlow
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2.6.6

Kube-OVN	7*24	Github Issue
Github Issue	AI	AI
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 2025 9 22

 2025 8 29

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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
```

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 2025 9 10

 2022 5 24



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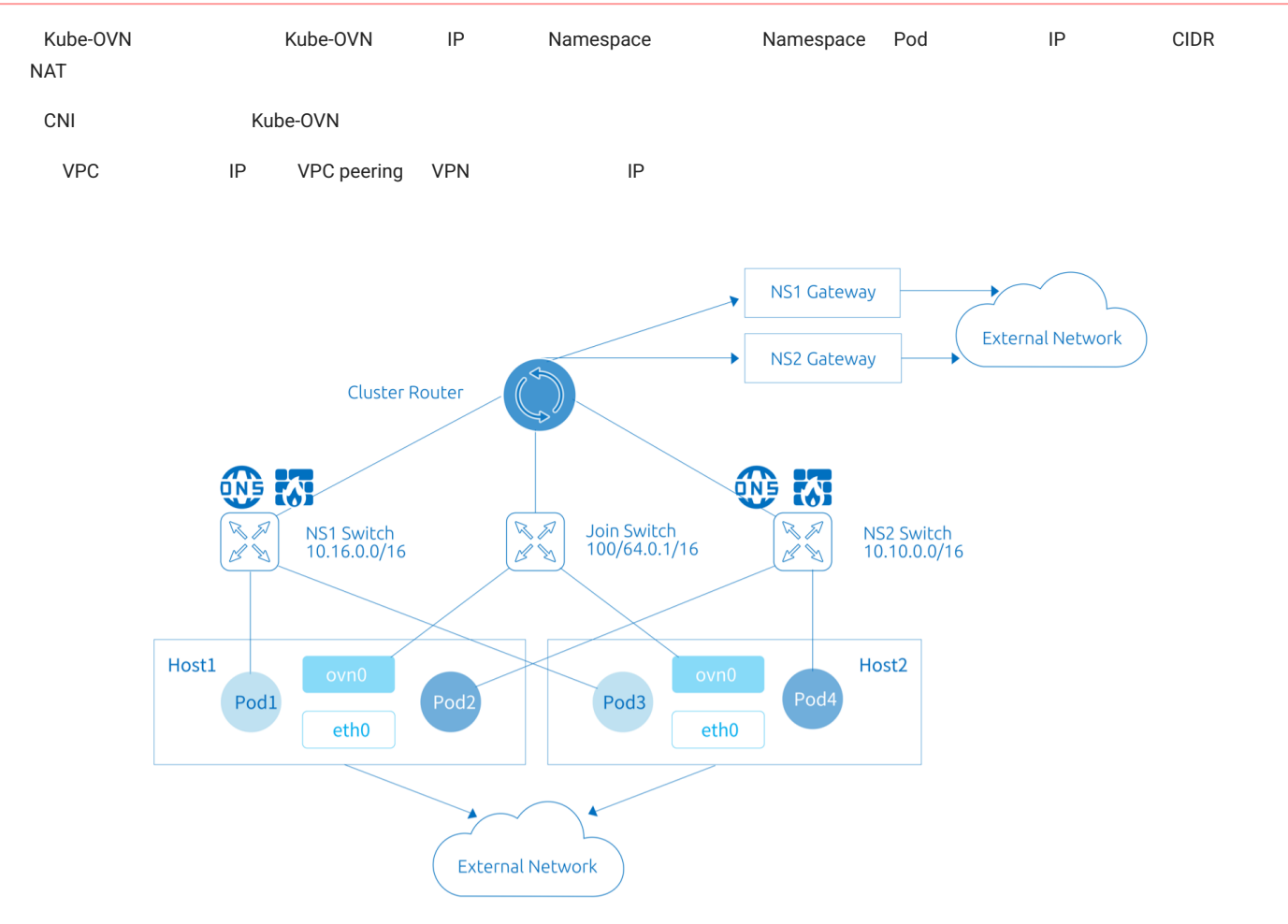




2.7.4

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-cfd27f6d5d6
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	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

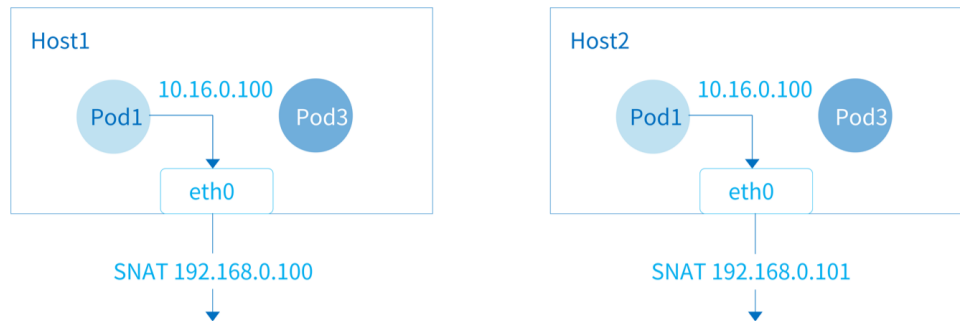
```
apiVersion: v1
kind: Pod
metadata:
  name: another-subnet
  annotations:
    ovn.kubernetes.io/logical_switch: subnet1
spec:
  containers:
  - name: another-subnet
    image: docker.io/library/nginx:alpine
```

Workload Deployment StatefulSet ovn.kubernetes.io/logical_switch Annotation

spec.template.metadata.annotations

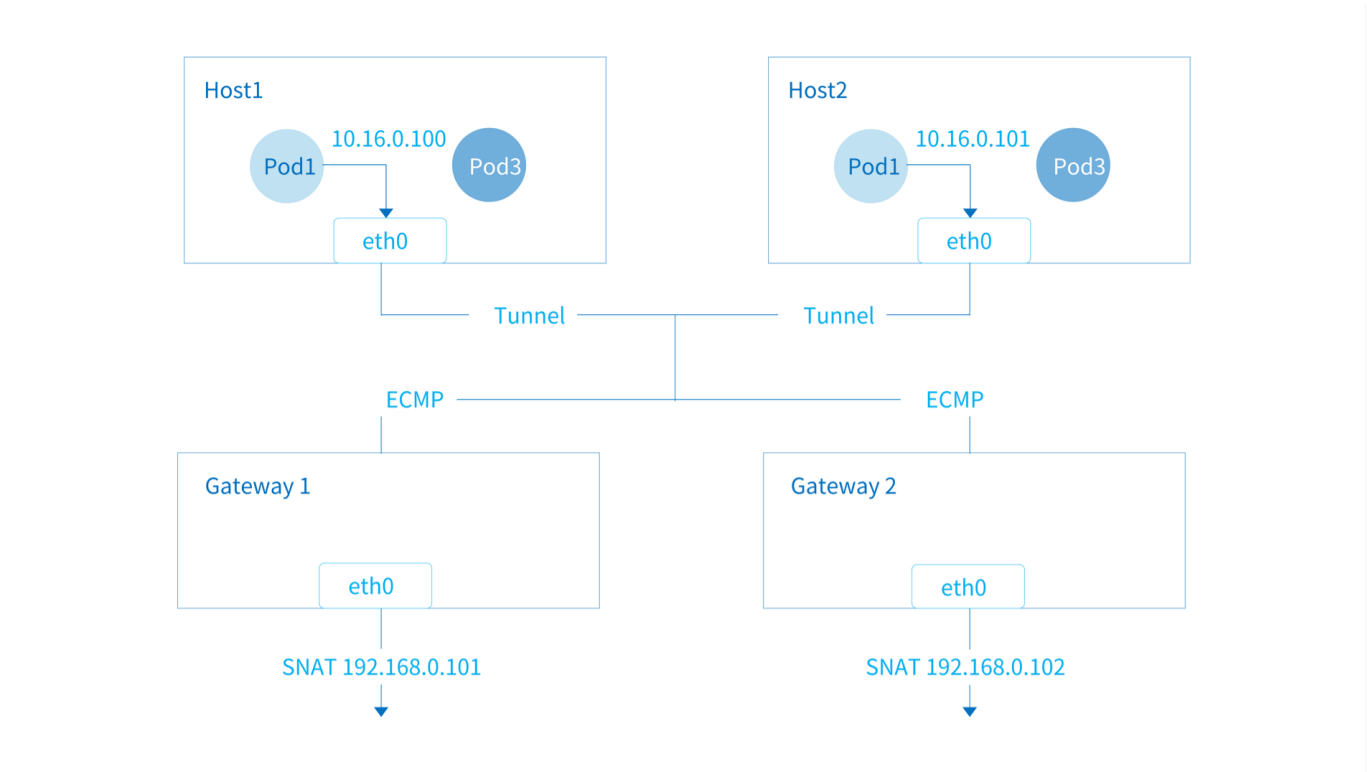
3.1.4 Overlay





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				
gatewayType	centralized	gatewayNode	Kubernetes	nodeName	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						
• <code>vlan:</code>	Underlay	Subnet	Vlan CR	Underlay		
• <code>logicalGateway:</code>	Underlay		OVN	Underlay	Overlay	<code>false</code>

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
10.10.10.0/24	Pod1	OVN1	Pod2	10.10.10.0/24	multicast snoop	OVN1	South Database	Multicast_Group

```
apiVersion: kubeovn.io/v1
kind: Subnet
metadata:
  name: sample1
spec:
  enableMulticastSnoop: 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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 2025 12 1

 2022 5 24



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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
<pre>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</pre>			
	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

<pre>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</pre>	
--	--

Workload	IP						
1. <code>ovn.kubernetes.io/ip_pool</code>	IP	CIDR					
2. <code>ovn.kubernetes.io/ip_pool</code>	IP	IP					
3. <code>ovn.kubernetes.io/ip_pool</code>	IP	replicas	Pod	Workload	<code>ovn.kubernetes.io/ip_pool</code>	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
```

subnet				
ips	IP	..	IPv6	
namespaces		Pod	IP	IP

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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🕒 2023 9 26

🕒 2023 2 16

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3.4.1

3.5 EIP SNAT

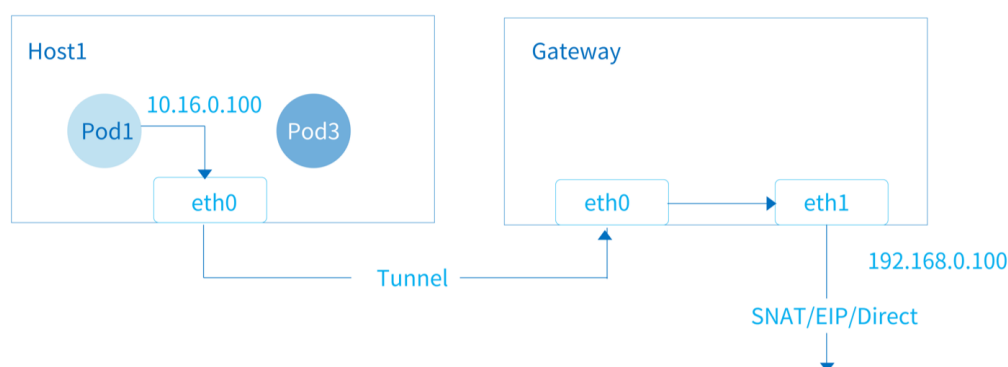
The diagram illustrates the configuration of VPC and NAT for Kube-OVN and OVN. It includes a list of VPC and NAT options, and a table mapping components to their respective configurations.

VPC and NAT Options:

- VPC
 - VPC iptables NAT
 - VPC OVN NAT
- NAT
 - OVN NAT
 - iptables NAT

Configuration Table:

Component	VPC	NAT	Other
Kube-OVN	VPC	OVN NAT	pod annotation
EIP	VPC	OVN NAT	provider-network vlan subnet CRD
Pod	NAT	VPC OVN NAT	ovn-eip ovn-dnat ovn-fip ovn-snat CRD
Pod	VPC	iptables NAT	VPC iptables NAT



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 ko nbctl show
switch 3de4cea7-1a71-43f3-8b62-435a57ef16a6 (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 ko 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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 2025 9 10

 2022 5 24

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3.5.6

3.6 QoS

Kube-OVN	Pod	QoS
• QoS		
• linux-netem QoS		
	Pod	QoS
	Namespace	Subnet
	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%

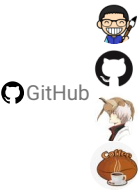
 PDF

 Slack

 Support

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3.6.3

3.7

Kube-OVN	IPv4 IPv6
Kubernetes	Kubernetes

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
```

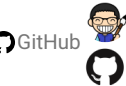
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 Slack

 Support

 2025 9 10

 2022 5 24



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

Webhookcert-managerWebhookcert-manager

cert-manager:

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

cert-managercert-manager

3.8.2 Webhook

Webhookyaml:

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

PodPod 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>

yamlIPPod

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

yamlPodIP

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-validating.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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Support

 2023 5 9

 2022 5 24

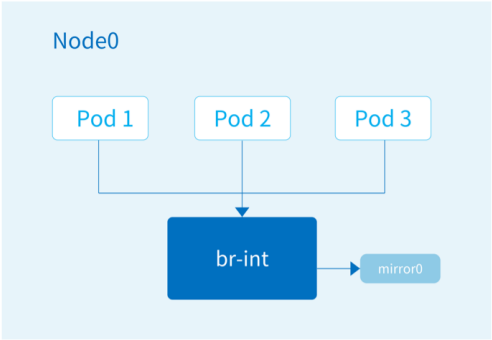
 GitHub 

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

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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 2025 11 20

 2022 5 24

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3.9.4

3.10 LoadBalancer Service

Kube-OVN VPC VPC VPC LoadBalancer Service LoadBalancerIP VPC 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
```

Subnet provider ovn .ovn Kube-OVN logical switch

provider ovn .ovn Kube-OVN IPAM IP

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 net-attach-def Pod

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 lb-svc-test-service-6869d98dd8-cjv1l READY STATUS RESTARTS AGE
lb-svc-test-service-6869d98dd8-cjv1l 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-cjv1l
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": {}}]
  labels:
    app: dynamic
    name: test-service
    namespace: default
spec:
  containers:
    - name: test-service
      image: nginx
      ports:
        - containerPort: 80
  dnsPolicy: ClusterFirst
  nodeName: k8s-node1
  restartPolicy: Always
  schedulerName: default-scheduler
  securityContext: {}
  serviceAccountName: default
  terminationGracePeriodSeconds: 30
  volumes:
    - name: kubelet-mount-cni-netconf
      hostPath: /etc/cni/netconf
      mountPath: /etc/cni/netconf
      readOnly: true
```

```

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: 161ede1-7f6e-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           =</h3>
  <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::b885: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
```

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 2025 9 10

 2022 7 19



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3.10.3

3.11

Kube-OVN	Prometheus					
kube-prometheus	CRD	Prometheus	kube-prometheus	CRD	Kube-OVN	Kube-OVN

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 yml interval

3.11.2 Grafana

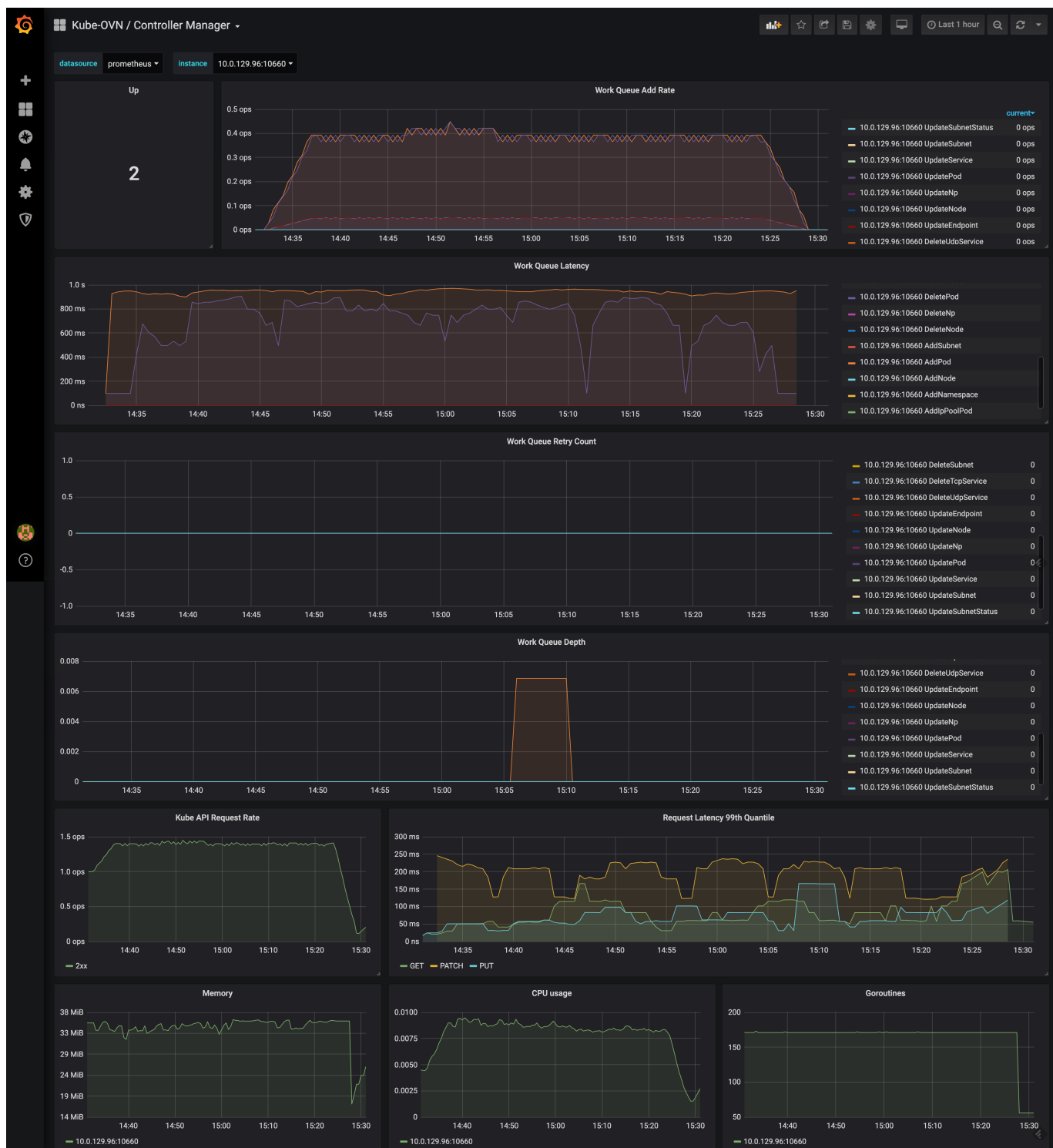
Kube-OVN Grafana Dashboard

Dashboard

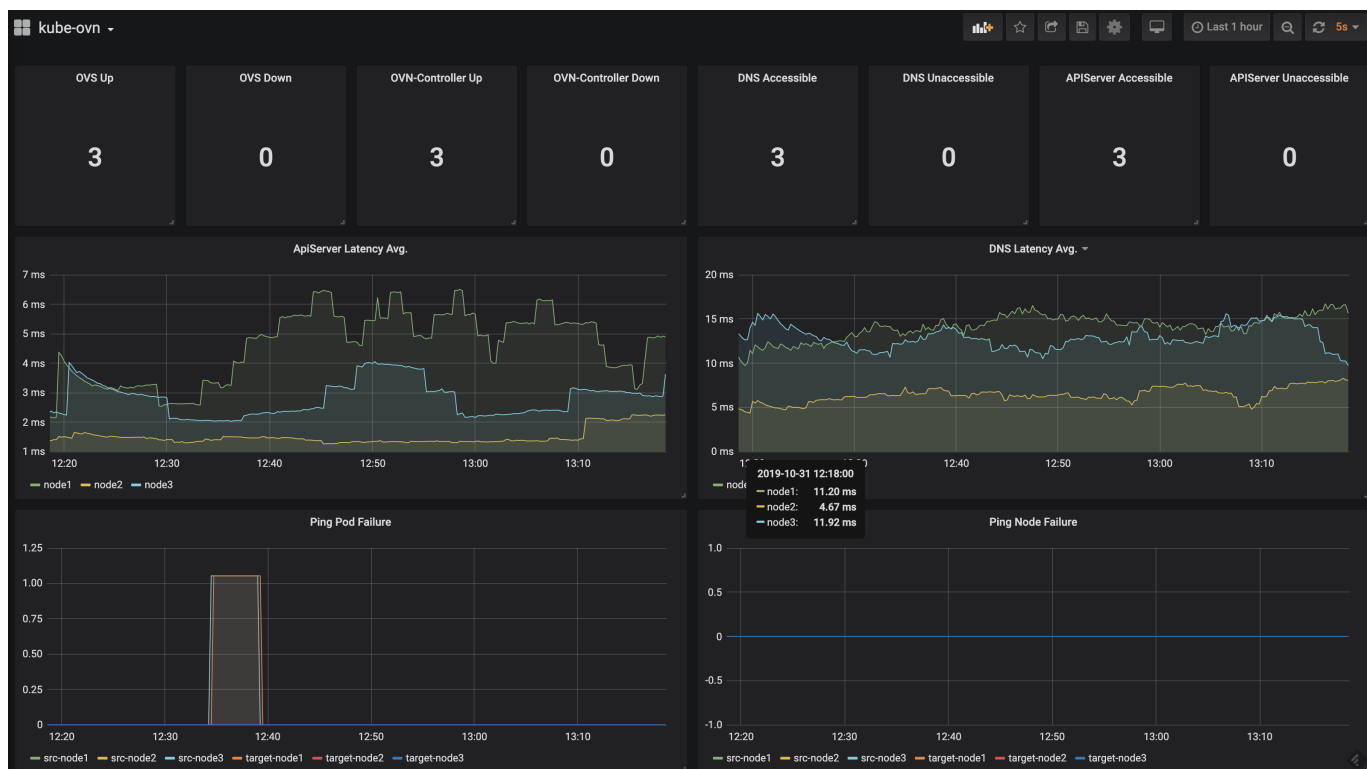
```
#
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/monitoring/pinger-grafana.json
# kube-ovn-controller
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/monitoring/controller-grafana.json
# kube-ovn-cni
wget https://raw.githubusercontent.com/kubeovn/kube-ovn/master/dist/monitoring/cni-grafana.json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



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 2025 9 17

 2022 5 23

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3.11.3

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
----------	-----	----------------------	---------------	-----

PORT 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.except	IP	
•	<	>	<	>	.egress.allow	IP	
•	<	>	<	>	.egress.except	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	NetworkPolicy		Pod A	http	8080	Pod B	http	8081
	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,dl_src=00:00:00:21:b7:d1,dl_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, dl_src=96:7b:b0:2f:a0:1a, dl_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

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

Kube-OVN

• standard	NetworkPolicy	IP						
• lax		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`

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2025 12 22

2025 10 23



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

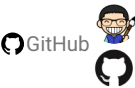
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- OVN
- IPAM
- OVN

```
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
```



4. KubeVirt

4.1 VM IP

IP	VM	VM	IP
CNI			
• IP VM VM IP			
• IP Node VM IP			
• IP VM IP			
KubeVirt masquerade iptables VM VM IP masquerade bridge			
• Pod IP VM IP Pod IP			
• masquerade iptables bridge			
• masquerade			
• masquerade conntrack			
Kube-OVN KubeVirt bridge managedTap IP VM IP VM annotation VM IP			
Kube-OVN Multus			

4.1.1 IP VM

VM	IP	IP	VM	Kube-OVN	IPAM	VM	VM	IP
bridge		VM	IP					

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

VMIP/MacVMannotationVMIPKubeVirt

```
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

<pre>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"}</pre>
<pre>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"}</pre>

Annotation KubeVirt Clone API

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 2025 9 10

 2025 8 13

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4.2.3

4.3

KubeVirt	Bridge	DHCP	virt-launcher	KubeVirt	IPv4	DHCP	Bridge	KubeVirt VM	RA	IPv6	Kube-
OVN	DHCP RA	KubeVirt	DHCP/RA								
KubeVirt 1.4.0		Network Binding Plugin	Bridge	managedTap		KubeVirt	DHCP	managedTap		Kube-OVN	
DHCP/RA	VM										

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"
  enableDHCP: 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

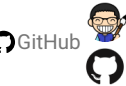
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🕒 2025 9 10

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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.

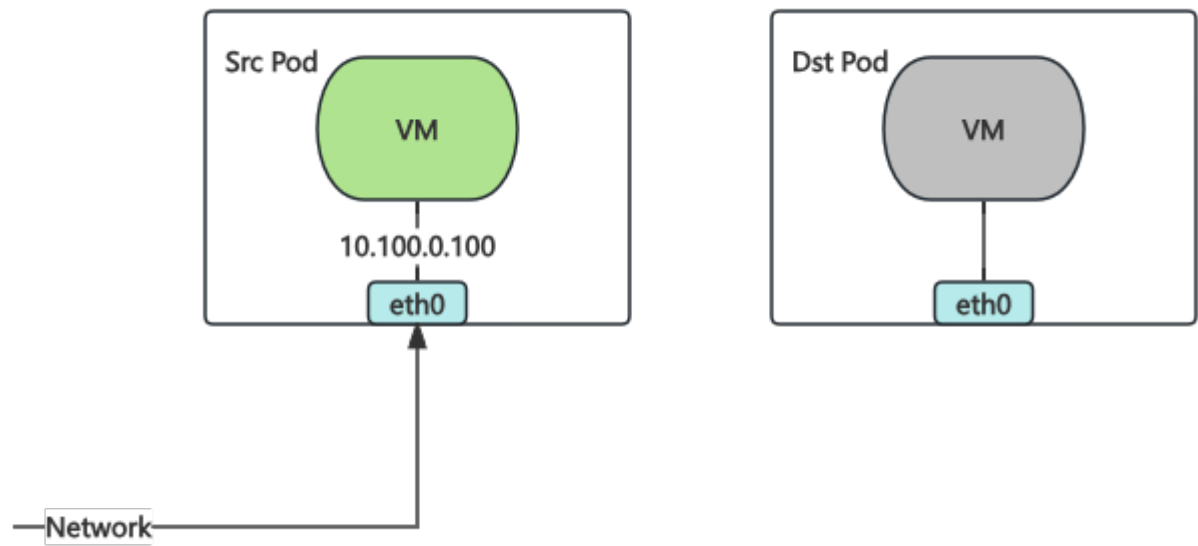
```
virtctl migrate testvm
```

VM SSH ping

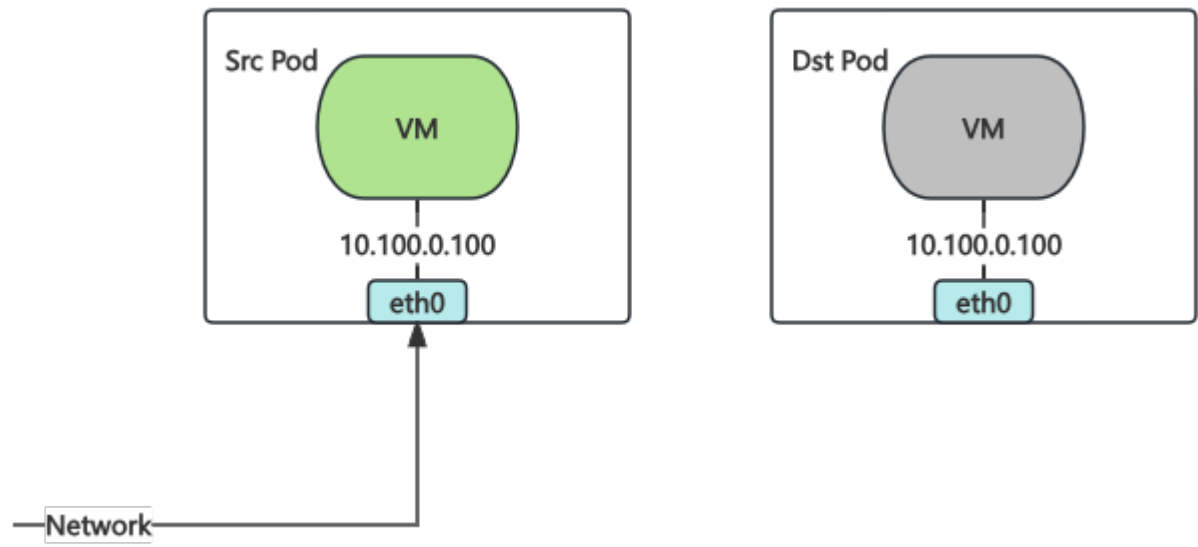
4.4.2

Kube-OVN [Live migration - Reducing downtime with multichassis port bindings](#)

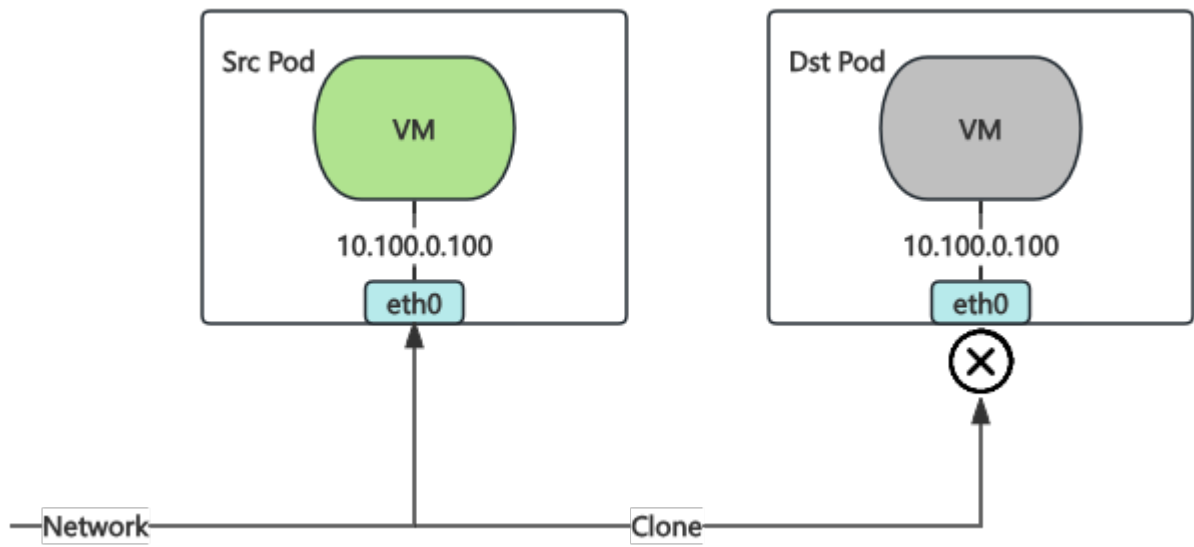
1. KubeVirt Pod IP



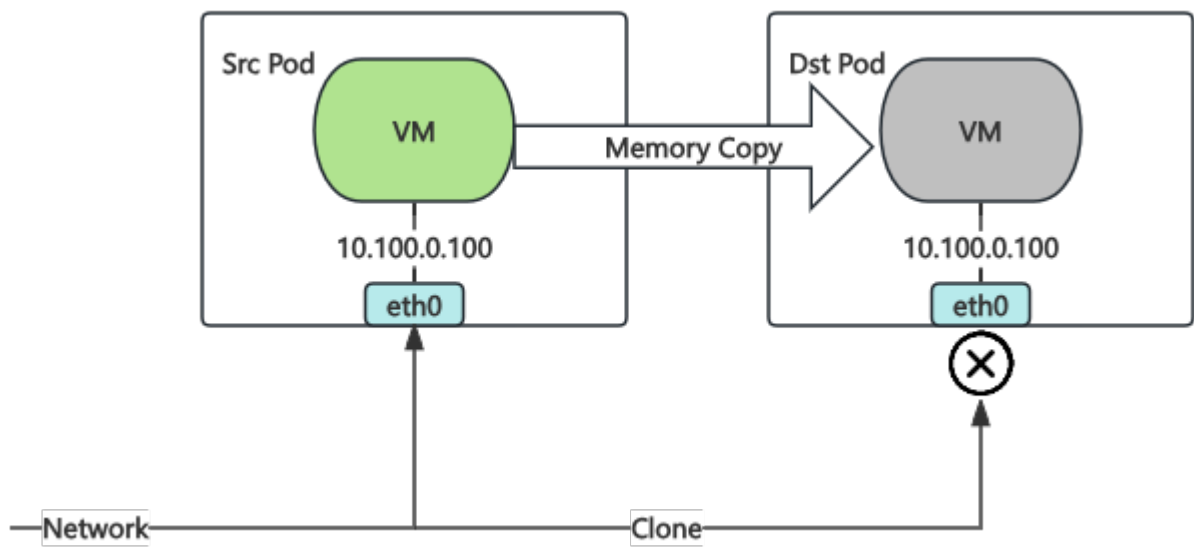
1. Kube-OVN Pod Pod Pod



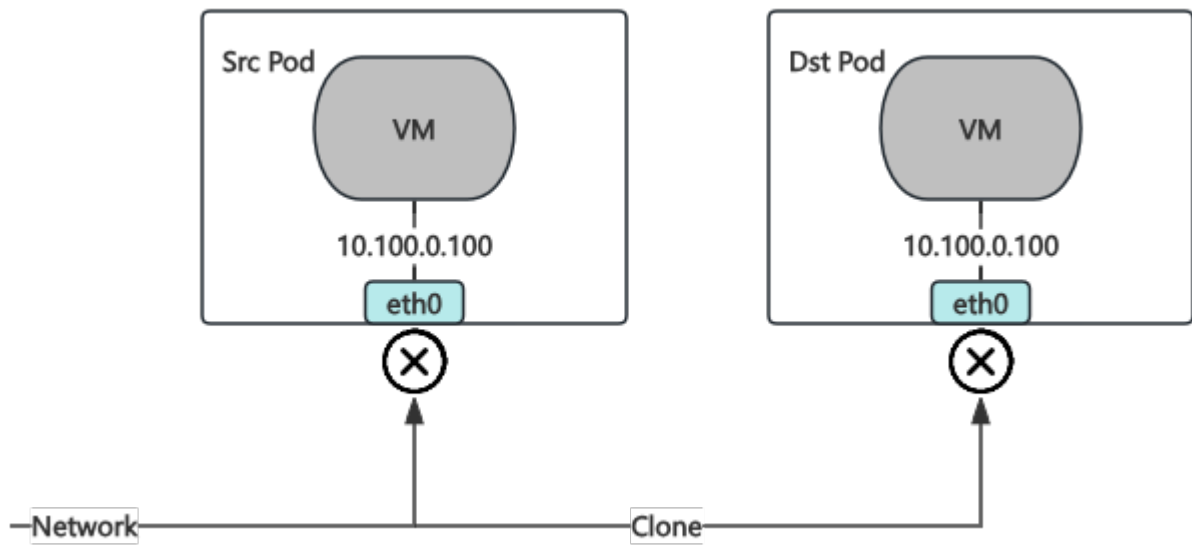
1. Kube-OVN Pod Pod Pod Pod Pod



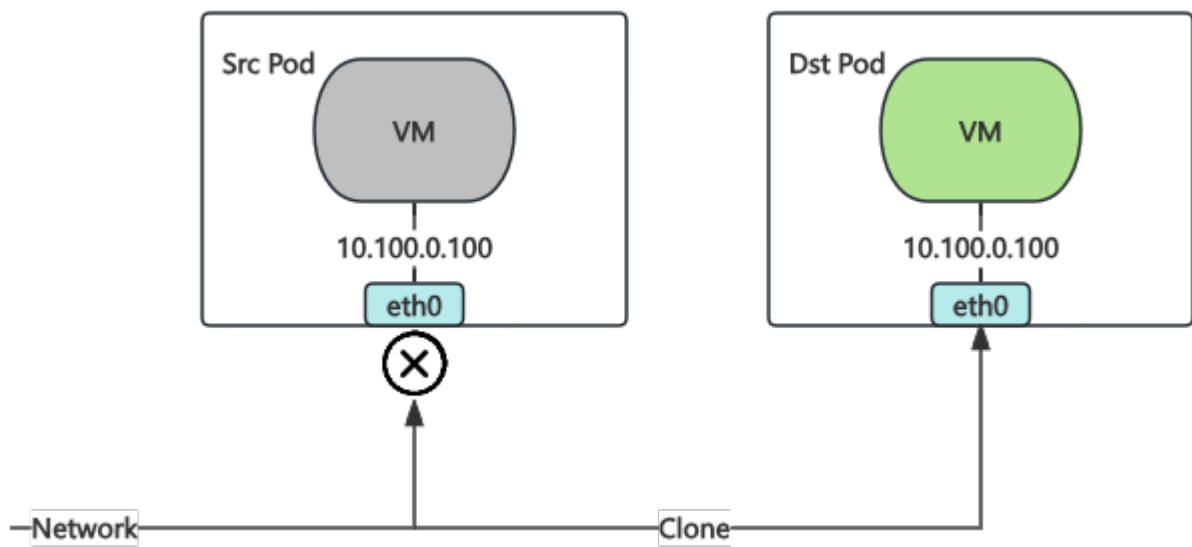
1. KubeVirt VM



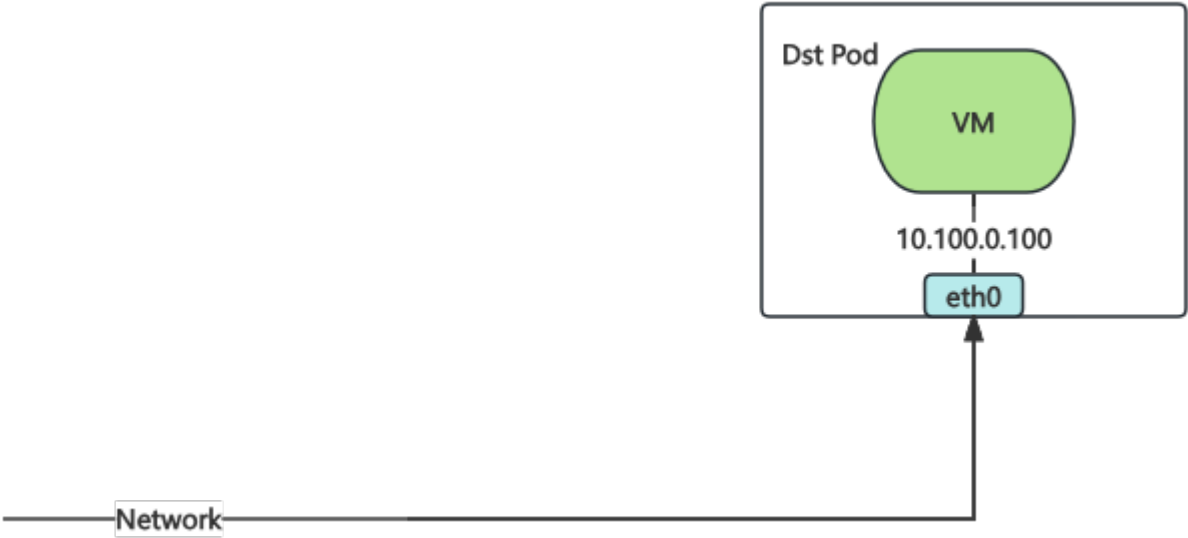
1. KubeVirt Pod Pod



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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 Support

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🕒 2025 3 3

 GitHub



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.yaml
```

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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[Slack](#)

[Support](#)

 2025 11 18

 2025 11 18

4.5.4

4.6 DHCP

managedTapSR-IOVDPDKKubeVirtDHCPKube-OVNOVNDHCPDHCPKubeVirt

DHCPIPKube-OVNDHCPDHCPv6, IPv6RA, DNSTFTPDHCPDHCPDHCP

Warning

1. bridgeKubeVirtDHCPKube-OVNDHCPKube-OVNDHCPKube-OVNDHCPmanagedTap

bridgemanagedTapmanagedTap

2. DHCPPodDHCP

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-nbDHCPDHCP Options"lease_time=3600, router=\$ipv4_gateway,server_id=169.254.0.254, server_mac=\$random_mac"server_id=\$random_mac

• enableIPv6RA:DHCPv6

• ipv6RAConfigsovn-nbLogical_Router_PortLogical Router Portaddress_mode=dhcpv6_stateful, max_interval=30,min_interval=5, send_periodic=true

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Support

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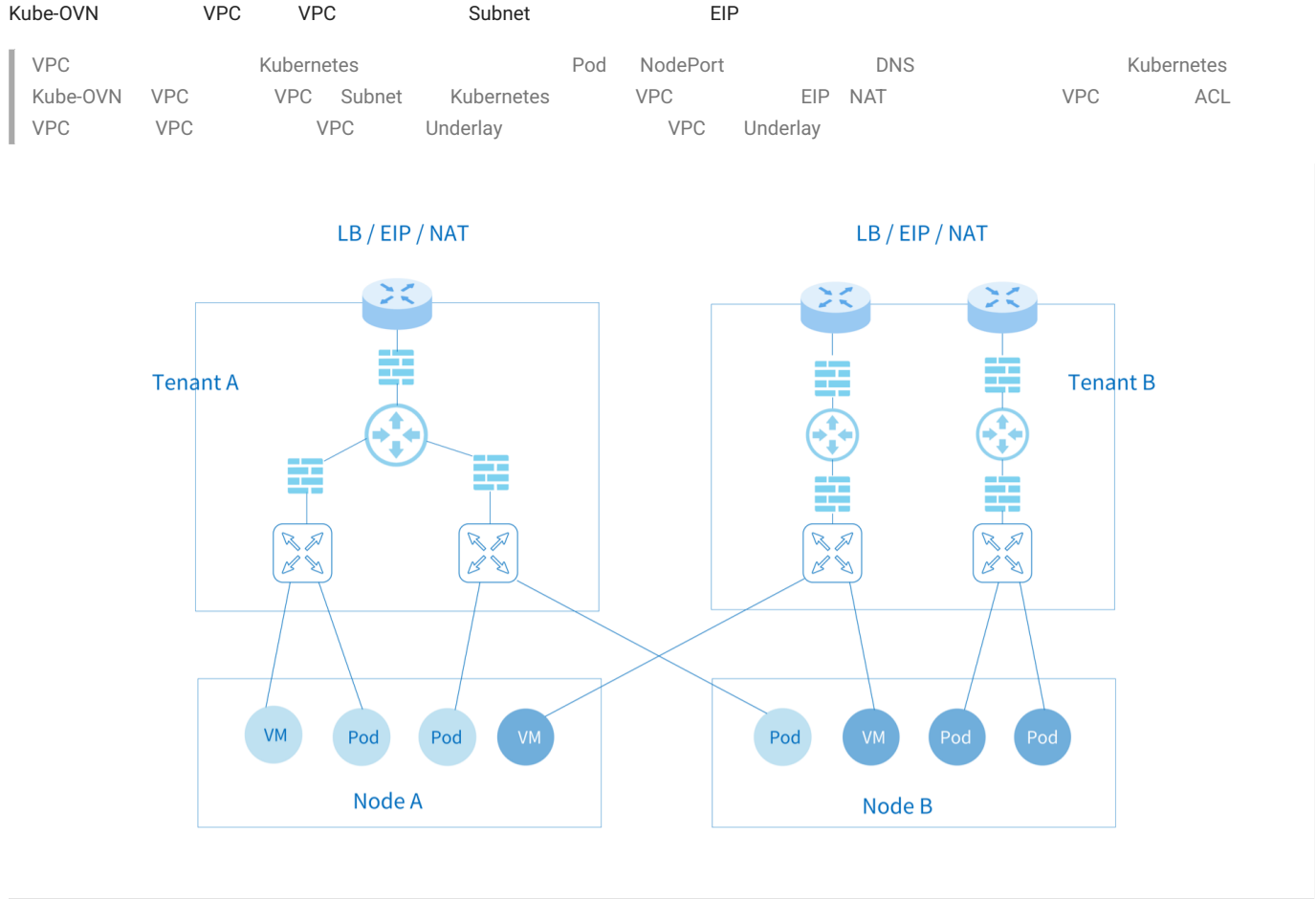
4.6.1

- 86/313 -

2025 Kube-OVN Team

5. VPC

5.1 VPC



5.1.1



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

VPC kube-system ovn-vpc-nat-gw-config nodeSelector

```
---
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

DNATEIPVPCIP

```
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

SNATVPCPodEIPSNAT

```
---
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: 10.0.1.0/24
```

IP

IPVPCIP EIP EIPVPCIP VPCIP SNATEIP

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

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

5.1.4

VCKube-OVN

```
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

 **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 |         |          |                |         |          |         |     |     |

VPC Egress Gateway      VPC      VPC    Pod

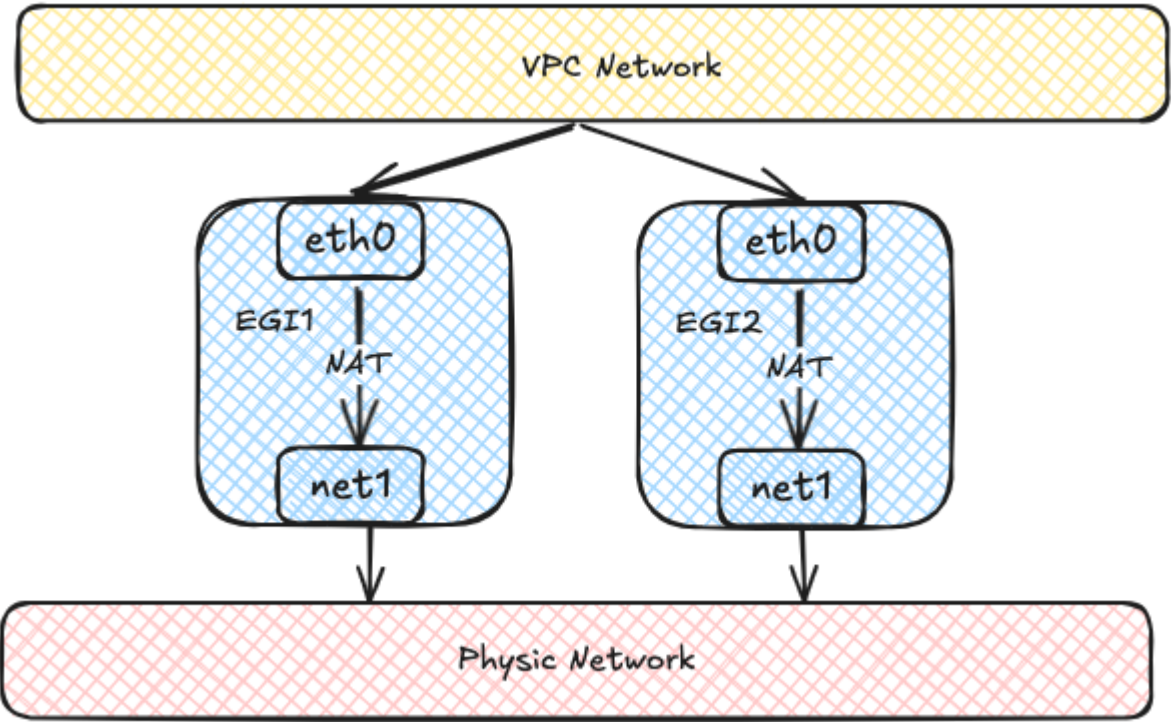
- ECMP    Active-Active
- BFD    <1s
- IPv6
- Namespace    Pod
- Node    Egress Gateway

VPC Egress Gateway

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

### 5.2.1

Egress Gateway      Pod      Pod                      VPC                      Macvlan                      Egress Gateway      NAT



Egress Gateway

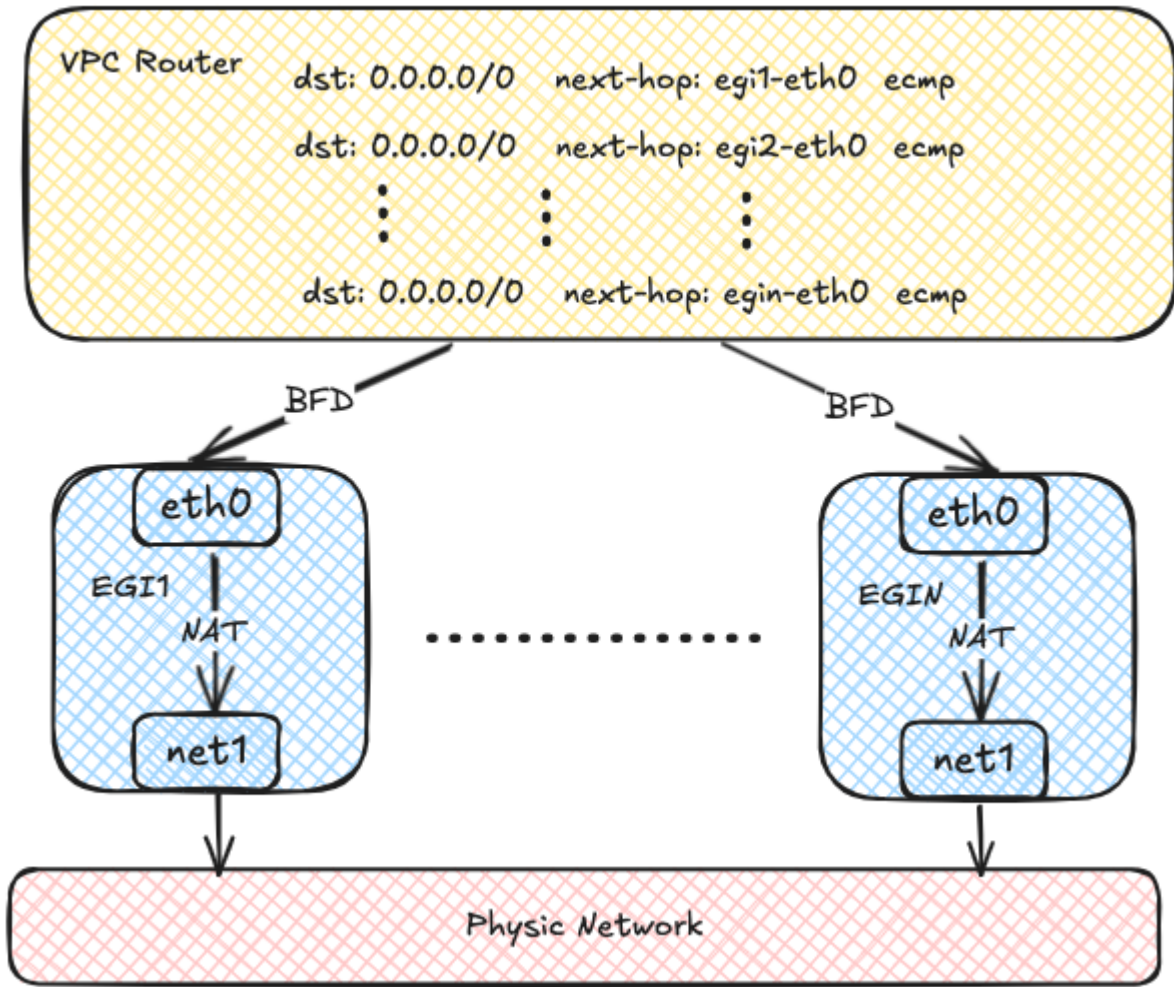
OVN

VPC Pod

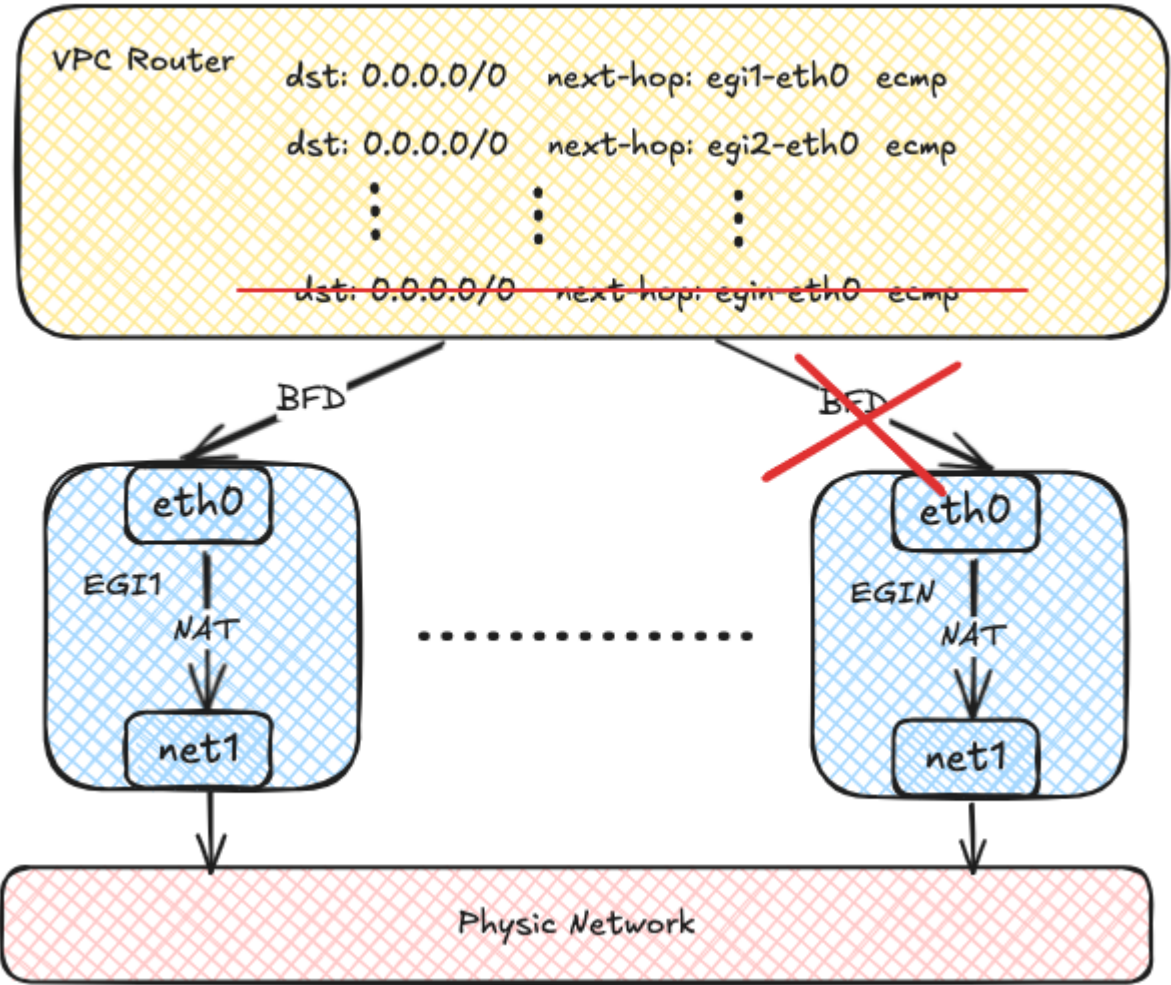
OVN

Egress Gateway

Egress Gateway



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-b9f8b4448-76lhm 1/1 Running 0 4m48s 10.16.0.12 kube-ovn-worker <none> <none>
```

Pod    IP      iptables

```
$ kubectl exec gateway1-b9f8b4448-76lhm -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-b9f8b4448-76lhm -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-fully
```

## 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
vpcgressgateway.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 ko nbctl show vpc1
router 0c1d1e8f-4c86-4d96-88b2-c4171c7ff824 (vpc1)
 port bfd@vpc1
 mac: "8e:51:4b:16:3c:90"
 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
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-wmmw6 1/1 Running 0 2m18s 192.168.0.2 kube-ovn-worker <none> <none>

$ kubectl ko nbctl 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 ko nbctl list bfd
_uuid : 223ede10-9169-4c7d-9524-a546e24bfab5
detect_mult : 3
dst_ip : "192.168.0.2"
external_ids : {af="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 : {af="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 bfd -- bfd-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 bfd -- bfd-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

|                               |              |       |                                                                 |                                 |
|-------------------------------|--------------|-------|-----------------------------------------------------------------|---------------------------------|
| enabled                       | boolean      | false | BFD Port                                                        | true                            |
| ip                            | string       | -     | BFD Port IP IPv6                                                | 169.255.255.255 169.255.255.255 |
| nodeSelector                  | object       | -     | BFD Port BFD Port                                               | -                               |
|                               |              |       | OVN HA Chassis Group Active/Backup Active nodeSelector Kube-OVN |                                 |
|                               |              |       | kubectl ko nbctl list ha_chassis_group OVN HA Chassis Group     |                                 |
| nodeSelector.matchLabels      | dict/map     | -     |                                                                 | -                               |
| nodeSelector.matchExpressions | object array | -     |                                                                 | -                               |

## VPC EGRESS GATEWAY

## Spec

|                |               |             |      |                                                                                                    |                            |
|----------------|---------------|-------------|------|----------------------------------------------------------------------------------------------------|----------------------------|
| vpc            | string        | VPC cluster | ovn- | 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<br>IP<br>IP<br><br><replicas> + 1<br>Pod                                               | 10.16.0.101 / fd00::11 / 1 |
| externalIPs    | string array  | -           |      | IP<br>IPv6<br>IP<br><br><replicas> + 1<br>Pod                                                      | 10.16.0.101 / fd00::11 / 1 |
| 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<br>Egress Gateway<br>VPC Egress<br>Gateway<br>Egress | Local                      |

BFD

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

Egress

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

Selectors

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

|                  |              |   |   |
|------------------|--------------|---|---|
|                  |              |   |   |
| matchLabels      | dict/map     | - | - |
| matchExpressions | object array | - | - |
| matchFields      | object array | - | - |

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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 Support

 2025 11 20

 2024 12 12

 GitHub



## 5.3 VPC QoS

Kube-OVN      QoSPolicy CRD      VPC

### 5.3.1 EIP QoS

EIP      1Mbps      1      shared=false      QoSPolicy      EIP      QoSPolicy      QoS

QoSPolicy

```
apiVersion: kubeovn.io/v1
kind: QoSPolicy
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
```

IptablesEIP

```
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      QoSPolicy      QoSPolicy

QoSPolicy

```
apiVersion: kubeovn.io/v1
kind: QoSPolicy
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 | QoSPolicy | QoSPolicy |
|------|-------|---|-------------|-----------|-----------|

### QoSPolicy

```
apiVersion: kubeovn.io/v1
kind: QoSPolicy
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

.

QoS

QoS

QoS

EIP

NATGW

spec.qosPolicy

 PDF

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 Support

 2023 10 25

 2023 5 9

 GitHub



5.3.8

## 5.4 VPC

| Kubernetes    | Service | VPC              | Service |
|---------------|---------|------------------|---------|
| 1. Service IP | VPC     |                  |         |
| 2.            | IP      |                  |         |
| Kube-OVN      | 1.11    | SwitchLBRule CRD | VPC     |
| SwitchLBRule  | VPC     |                  |         |

### 5.4.1 Selector

| selector                                                                                                                                                                                                                                                                     | label        | pod                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------|
| SwitchLBRule                                                                                                                                                                                                                                                                 |              |                    |
| <pre>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</pre> |              |                    |
| • 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                                                                                                                                                                                                                                                                                                              |          |                    |    |
| <pre>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</pre> |          |                    |    |
| • 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 : 3cbb6d43-44aa-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>Thank you for using nginx.</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 : 3cbb6d43-44aa-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
switchlbrule.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:~#
```

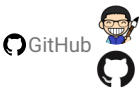
 [PDF](#)

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 2025 9 10

 2022 12 15



5.4.4

---

## 5.5 VPC DNS

|                                                                                                                                                                |         |     |     |         |     |            |         |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|-----|---------|-----|------------|---------|-----|
| VPC                                                                                                                                                            | VPC     | VPC | VPC | coredns | VPC | Kubernetes | vpc-dns | CRD |
| CRD                                                                                                                                                            | coredns | Pod | VPC | VPC     | VPC | VPC        |         |     |
| <div><div> <b>Note</b></div><div>DNSPod VMWebhook/etc/resolv.conf</div></div> |         |     |     |         |     |            |         |     |

### 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/master/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, 9153/TCP | kube-system/slr-vpc-dns-test-cjh1 | 113s |

VPC   Pod   dns   :

nslookup kubernetes.default.svc.cluster.local 10.96.0.3

VPC   switch lb rule          VPC          Pod

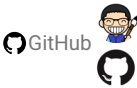
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🕒2025 9 10

🕒2022 12 26



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 | Running |  |

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-99fff7f86-52h9r | 1/1   | Running           | 0        | 5h41m | 10.16.0.14 | kube-ovn-control-plane | <none>         | <none>          |
| test-99fff7f86-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:
IPs: <none>
.
.
.
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 "40636e0c7f1ade5500fa958486163d74f2e2300051a71522a9afd7ba0538afb6": 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>    |      | <none>    |       |
| sg-gw-both  | 1/1   | Running           | 0        | 5h37m | 10.16.0.19 | kube-ovn-worker | <none>    |      | <none>    |       |

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 2025 10 24

 2023 2 28

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5.7 OVN EIP FIP SNAT DNAT

 **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 |         |          |                |         |          |         |     |     |

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-snat CRD

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

Pod SNAT Pod Fip

```
graph LR
pod-->subnet-->vpc-->lrp--bind-->local-chassis-->snat-->lsp-->external-subnet
lrp-.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 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"
```

```
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: vlan0
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: vlan0
 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 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 276baccb-fe9c-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 276baccb-fe9c-4476-b41d-05872a94976d fd9f140c-c45d-43db-a6c0-0d4f8ea298dd]
```

5.7.3 2. ovn-eip

| iptables-eip |                    | ovn-eip |    | type              |      |
|--------------|--------------------|---------|----|-------------------|------|
| • nat:       | ovn dn timer, 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: external204
 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
kubectl get ofip eip-static
NAME VPC V4EIP V4IP READY IPTYPE IPNAME
eip-static vpc1 10.5.204.101 192.168.0.2 true vip vpc-1-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 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 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 vpc1-busybox03 -- bash
[root@vpc1-busybox03 /]#
[root@vpc1-busybox03 /]#
[root@vpc1-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:fe56:40e5/64 scope link
 valid_lft forever preferred_lft forever

[root@vpc1-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: OvnEip
apiVersion: kubeovn.io/v1
metadata:
```

```

name: snat-for-subnet-in-vpc
spec:
 externalSubnet: external204
 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 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 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
17895: eth0@if17895: <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:b: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
--- 223.5.5.5 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 10.5.49.4 00:00:00:4D:CE:49 dnat true

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

## 4.2 ovn-dnat vip dn timer

```
kind: OvnDnatRule
apiVersion: kubeovn.io/v1
metadata:
 name: eip-dnat
spec:
 ipType: vip # dnat pod ip vip
 ovnEip: 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 vip
 ovnEip: 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 test-dnat-vip 00:00:00:D0:C0:B5 test-dnat-vip test-dnat-vip vpc1-subnet1 true

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

kubectl get odnat 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
```



PDF



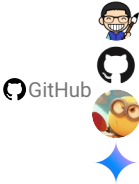
Slack



## Support

🕒 2025 9 30

🕒 2023 3 3



5.7.6

---

## 5.8 OVN SNAT    ECMP BFD    L3 HA

VPC    OVN SNAT    ECMP

Gateway Node    ovnext0

- bfd
- hash

```
graph LR
 pod-->vpc-subnet-->vpc-->snat-->ecmp-->external-subnet-->gw-node1-ovnext0--> node1-external-switch
 external-subnet-->gw-node2-ovnext0--> node2-external-switch
 external-subnet-->gw-node3-ovnext0--> 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

lsp    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
```

bfd ecmp

```
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 ["external1204","join","ovn-default"] ["vpc1"]
vpc1 true true true ["vpc1-subnet1"]

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-external1204
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-external1204
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-external1204
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.
k ko nbctl find Logical_Router_Static_Route policy=src-ip options=ecmp_symmetric_reply="true"
_uuid : 3aacb384-d5ee-4b14-aebf-59e8c11717ba
bfd : 684c4489-5b59-4693-8d8c-3beab93f8093
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 : ""

_uuid : 18bcc585-bc05-430b-925b-ef673c8e1aef
bfd : 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 : ""

_uuid : 7d0a4e6b-cde0-4110-8176-fbaf19738498
bfd : 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 ovnext bash ip a
/usr/sbin/ip: /usr/sbin/ip: cannot execute binary file
[root@pc-node-1 ~]#
[root@pc-node-1 ~]# ip netns exec ovnext 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: ovnext0: <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 ovnext0
 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 ovnext 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 ovnext0
10.5.204.0 0.0.0.0 255.255.255.0 U 0 0 0 ovnext0

internal port unerlay pod ns ns

[root@pc-node-1 ~]# ip netns exec ovnext bfdd-control status
There are 1 sessions:
Session 1
id=1 local=10.5.204.108 (p) remote=10.5.204.122 state=Up

lrp bfd lrp ecmp

[root@pc-node-1 ~]# ip netns exec ovnext 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

#
```

### ovnext ns

```
tcpdump -i ovnext0 host 223.5.5.5 -netvv
dropped privs to tcpdump
tcpdump: listening on ovnext0, 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 ovnext bash
[root@pc-node-2 ~]# tcpdump -i ovnext0 host 223.5.5.5 -netvv
dropped privs to tcpdump
tcpdump: listening on ovnext0, 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 ovnext bash
[root@pc-node-3 ~]# tcpdump -i ovnext0 host 223.5.5.5 -netvv
dropped privs to tcpdump
tcpdump: listening on ovnext0, 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
ovnext ns bfd
vpc subnet ping ()
()
```

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🕒2023 3 3



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 | 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=0.086 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
```

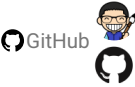
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 Support

 2025 7 2

 2022 5 24



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 {nodeName} [ovs-vsctl options ...] invoke ovs-vsctl on the specified node
ofctl {nodeName} [ovs-ofctl options ...] invoke ovs-ofctl on the specified node
dpctl {nodeName} [ovs-dpctl options ...] invoke ovs-dpctl on the specified node
appctl {nodeName} [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//nodename} {target ip address} [target mac address] {icmp|tcp|udp} [target tcp/udp port] trace ICMP/TCP/UDP
 {trace|ovn-trace} {node//nodename} {target ip address} [target mac address] arp {request|reply} trace ARP request/reply
diagnose {all|node|subnet|IPPorts} [nodename|subnetName|{proto1}-{IP1}-{Port1},{proto2}-{IP2}-{Port2}] diagnose connectivity of all nodes or a specific
node or specify subnet's ds pod 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-e6fcd5833dc (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-67c55dfd89-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: ["192.101.0.1/16"]
 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=0xcfc3429e6, 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->OXM_OF_METADATA[],load:0x1->NXM_NX_REG14[],resubmit(,8)
cookie=0xc91413c6, duration=671791.431s, table=0, n_packets=907489, 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->OXM_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->OXM_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->OXM_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:350805055 missed:21983648 lost:73
 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

```

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

nodeName    ovs-ovn    ovs-apctl    daemon    OVS    ovs-apctl(8)

```

kubectl ko apctl 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 100.64.0.3 > 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-l6n7p 8.8.8.8 icmp
+ kubectl exec ovn-central-5bc494cb5-np9hm -n kube-ovn -- ovn-trace --ct=new ovn-default 'inport == "ds1-l6n7p.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, dl_src=0a:00:00:10:00:05, dl_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-l6n7p.default")

0. ls_in_port_sec_l2 (ovn-northd.c:4143): inport == "ds1-l6n7p.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-l6n7p.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 36cdd577
 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=0/0x1);
 next;
16. ls_in_l2_lkup (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-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: ["192.101.0.1/16"]
 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
20000 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 : 3e5d5fff-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-cc806d32b492
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-vswnitchd log:
2022-06-02T23:03:00.137Z|00079|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,d1_src=00:00:00:f8:07:c8,d1_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(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,d1_src=00:00:00:f8:07:c8,d1_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(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,d1_src=00:00:00:dc:e3:63,d1_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=10.16.63.30,dst=10.16.0.10,proto=1,tp_src=8,tp_dst=0),in_port(4) mtu 0
2022-06-03T00:02:33.832Z|00082|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,d1_src=00:00:00:f8:07:c8,d1_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-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 "04d03360e9a0_h"
 Interface "04d03360e9a0_h"
 Port eeb4d9e51b5d_h
 Interface eeb4d9e51b5d_h
 Port mirror0
 Interface mirror0
 type: internal
 Port "8e5d887ccd80_h"
 Interface "8e5d887ccd80_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 DatabaseVswitchFileDataPath:/
etc/openvswitch/conf.db DatabaseVswitchFileLogPath:/var/log/openvswitch/ovsdb-server.log DatabaseVswitchFilePidPath:/var/run/openvswitch/ovsdb-server.pid
DatabaseVswitchFileSystemIDPath:/etc/openvswitch/system-id.conf ServiceVswitchdFileLogPath:/var/log/openvswitch/ovs-vswitchd.log ServiceVswitchdFilePidPath:/
var/run/openvswitch/ovs-vswitchd.pid ServiceOvnControllerFileLogPath:/var/log/ovn/ovn-controller.log ServiceOvnControllerFilePidPath:/var/run/ovn/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 ovsdb 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-ee5-4b3c-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-5d6885d89-4nf8h.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-7twb4 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 | pod       | IP Port         |           |     |           |

reload

Kube-OVN

```

kubectl ko reload
pod "ovn-central-8684dd94bd-vzgcr" 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-2klmh" 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
| | '-- ovssdb-server.log
| '-- ovn
| |-- ovn-controller.log
| |-- ovn-northd.log
| |-- ovssdb-server-nb.log
| '-- ovssdb-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
===== Prepareing 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%) 583 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
=====
```

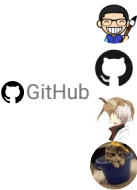
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 Support

🕒 2025 9 10

🕒 2022 5 24



6.1.3

## 6.2

Kubernetes

ovs-ovn

ovn-controller

ovn-central

Kubernetes

ovn-central

ovn-central

### 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-5rxfs, kube-system/kube-proxy-jpnm, kube-system/ovs-
ovn-v2kll
evicting pod kube-system/coredns-64897985d-qsgpt
evicting pod local-path-storage/local-path-provisioner-5ddd94ff66-1lss6
evicting pod kube-system/kube-ovn-controller-8459db5ff4-94lxb
pod/kube-ovn-controller-8459db5ff4-94lxb evicted
pod/coredns-64897985d-qsgpt evicted
pod/local-path-provisioner-5ddd94ff66-1lss6 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-5rxfs.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-fhw1w.kube-system
```

6.2.6chassis

uuidChassisid

```
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-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
```

 PDF

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 Support

 2023 4 25

 2022 6 3

 GitHub

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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2025 9 10

2022 5 24

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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) (self) 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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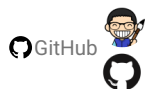
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Support

🕒 2025 9 10

🕒 2022 5 24



## 6.4.4



## 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  | false   | 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
```

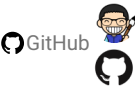
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Support

2025 9 10

2022 5 24



### 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
...
#
```

 PDF

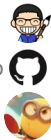
 Slack

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 2025 9 10

 2023 4 4

 GitHub



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 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"
```

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 2025 9 10

 2022 5 24

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6.8.10

---

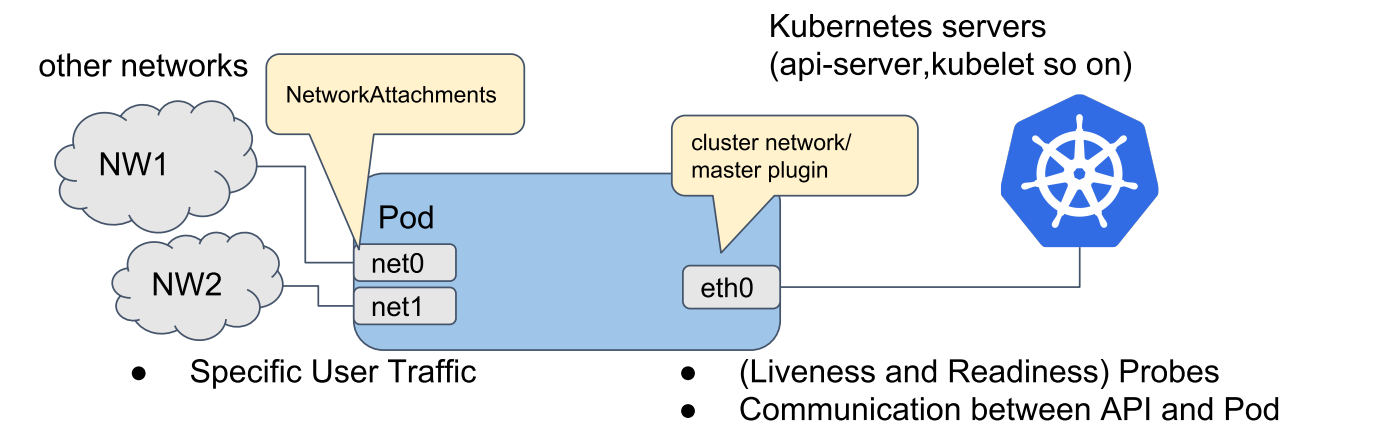
7.

7.1

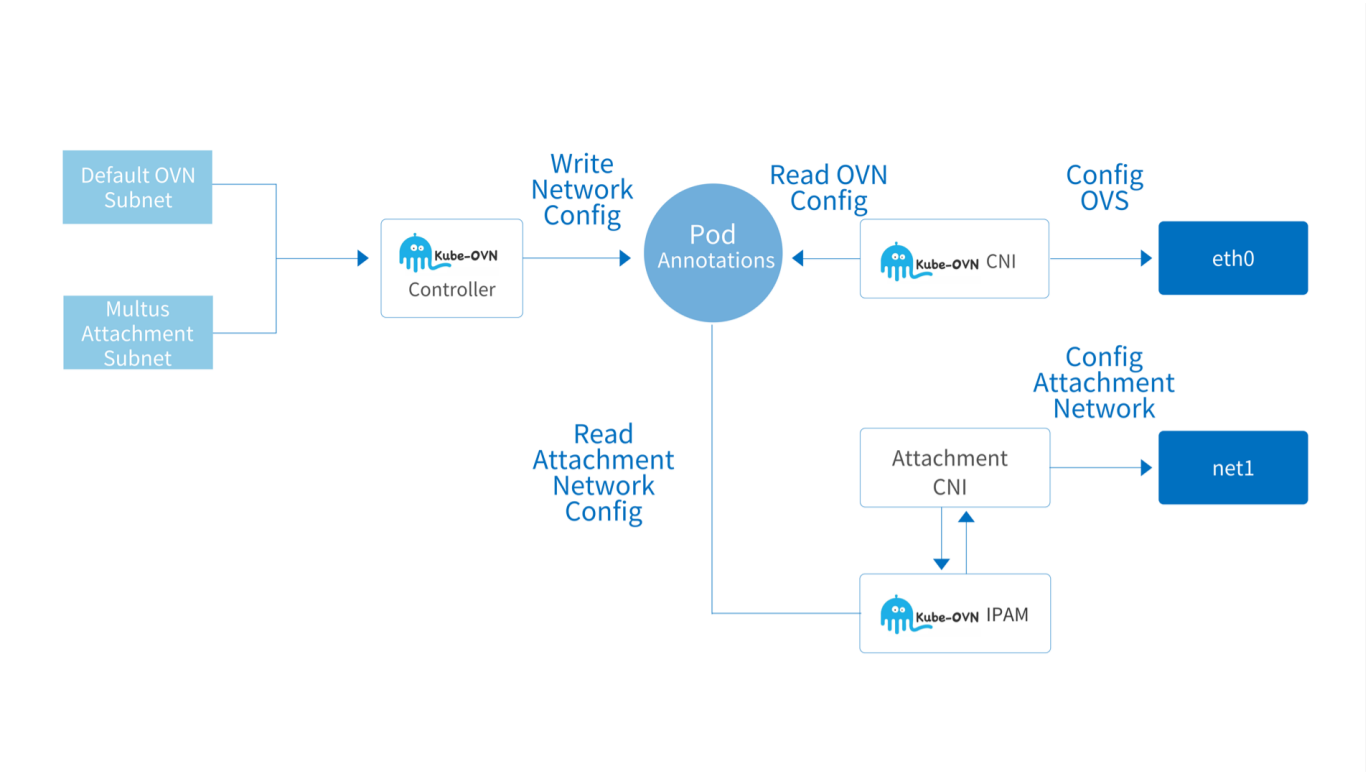
|          |     |          |      |             |      |          |    |
|----------|-----|----------|------|-------------|------|----------|----|
| Kube-OVN | CNI | macvlan  | vlan | host-device | IPAM | Kube-OVN | IP |
| Kube-OVN |     | Kube-OVN |      |             |      |          |    |

7.1.1

|            |     |     |                |      |      |      |            |            |                       |         |
|------------|-----|-----|----------------|------|------|------|------------|------------|-----------------------|---------|
| Multus CNI | pod | pod | eth0           | net0 | net1 | eth0 | kubernetes | kubernetes | kubernetes api-server | kubelet |
| net0 net1  |     | CNI | vlan/vxlan/ptp |      |      |      |            |            |                       |         |



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



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

### 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/ash", "-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

provider      ovn   subnet   IP   Pod   annotation 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         |



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/depmod.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](#)

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

STT

```
kubect1 set env daemonset/ovs-ovn -n kube-system TUNNEL_TYPE=stt
kubect1 delete pod -n kube-system -lapp=ovs
```

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 2025 10 28

 2022 5 24

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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

|

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🕒2025 9 10

🕒2022 5 24

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### 7.3.5

7.4 eBPF TCP

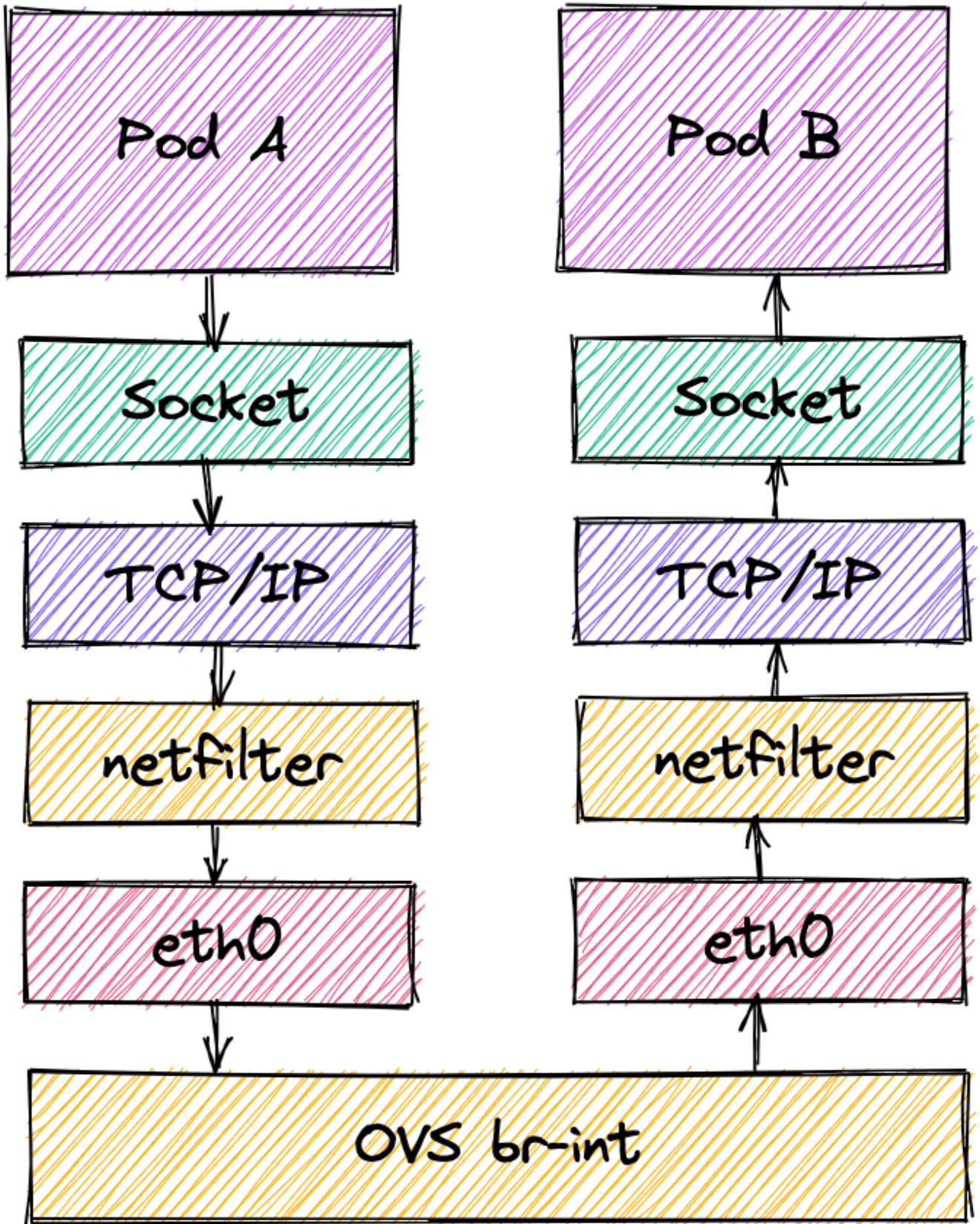
---

5G Pod TCP Intel [istio-tcpip-bypass](#) Pod eBPF TCP/IP socket

7.4.1

---

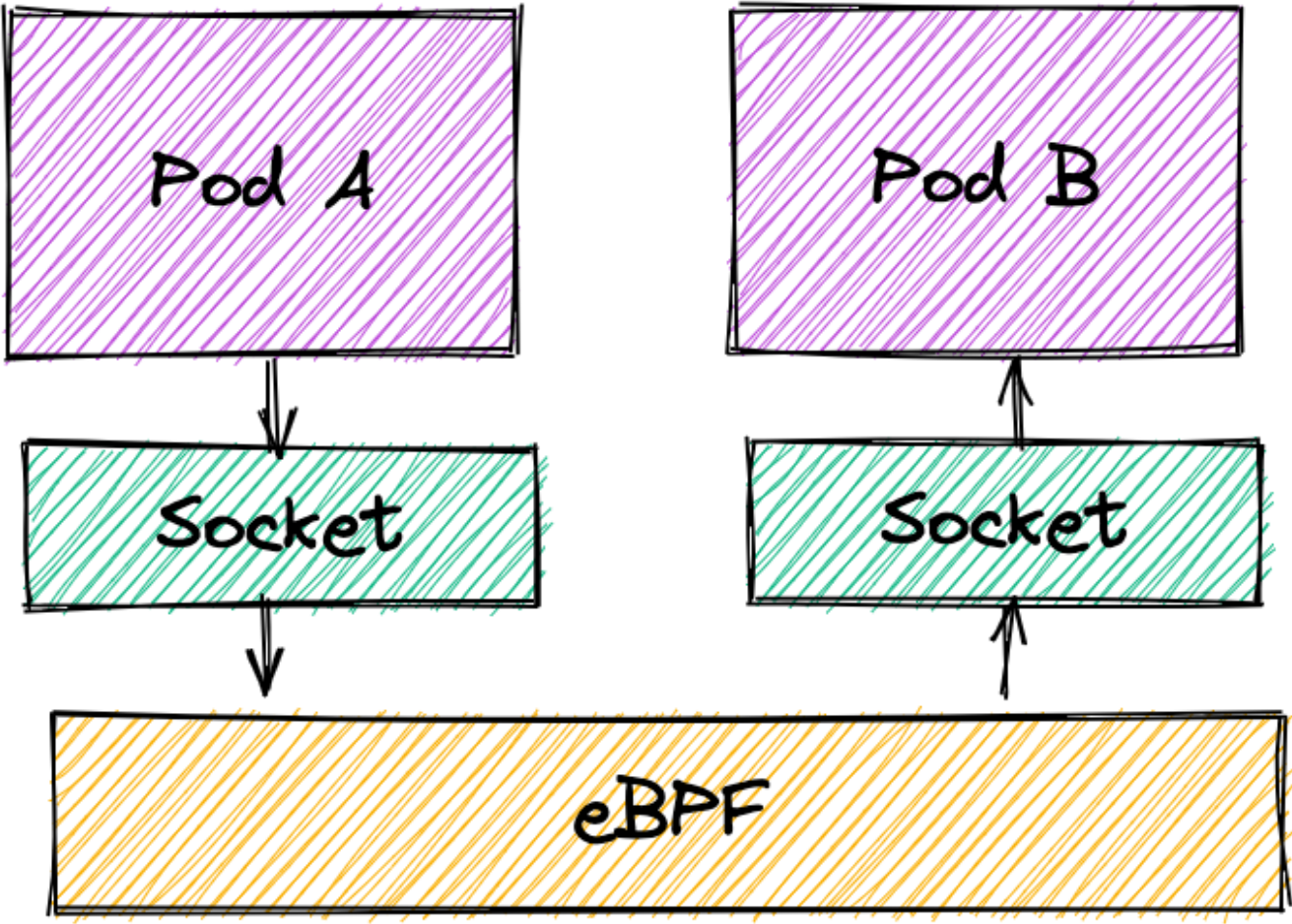
Pod TCP TCP/IP, netfilter OVS



istio-tcpip-bypass

TCP

socket



TCP                      Service Mesh                      Service Mesh

Tanzu Service Mesh Acceleration using eBPF

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

TCP40% ~ 60%102440% ~ 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                 |

512eBPFTCPeBPF 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](#)

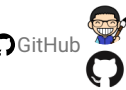
PDF

Slack

Support

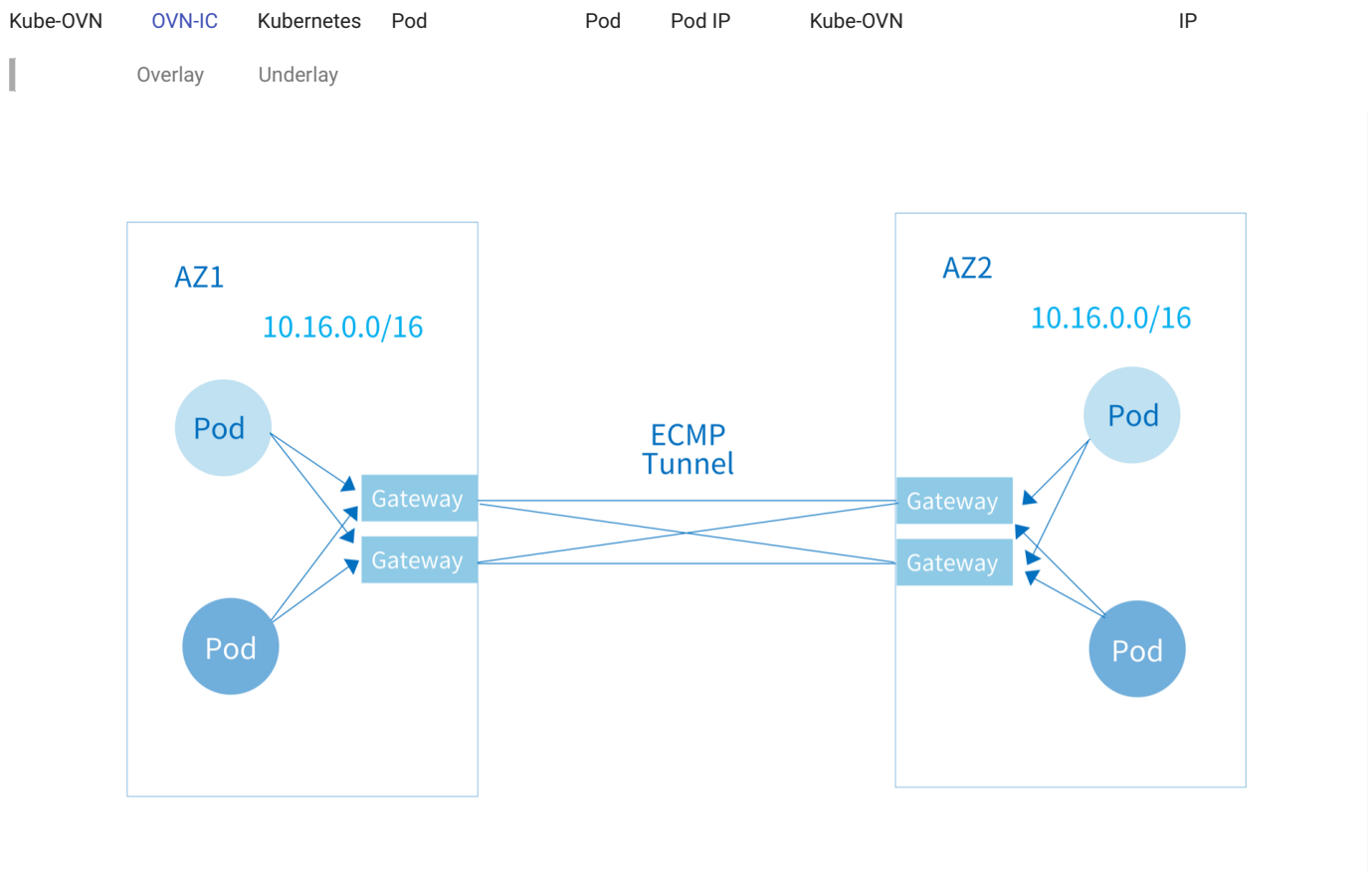
🕒2025 9 10

🕒2022 9 27



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\_IC=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...
deployment "ovn-ic-server" successfully rolled out
OVN IC Server installed Successfully
```

```
kubect1 ko icsbctl show
```

```
kubect1 ko icsbctl show
availability-zone az0
gateway 059b5c54-c540-4d77-b009-02d65f181a02
 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-a0d5-972c1ccec581
 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 da6138b8-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

```
kubectrl edit deployment ovn-ic-server -n kube-system
```

'TS\_NUM' TS\_NUM ECMP Path

## 7.5.7

ovn-ic-config Configmap

```
kubectrl -n kube-system delete cm ovn-ic-config
```

ts

```
kubectrl 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

|            |            |          |          |          |            |
|------------|------------|----------|----------|----------|------------|
| Submariner | Kubernetes | Pod      | Service  | Kube-OVN |            |
| OVN-IC     | Submariner | Kube-OVN | Kube-OVN | Service  | Submariner |

### 7.6.1

- Service CIDR      CIDR

### 7.6.2 Submariner

#### Note

Submariner v0.22.0    nftables      Kube-OVN      Submariner

```
kubectl create namespace submariner-operator
kubectl create configmap submariner-global --namespace=submariner-operator --from-literal=use-nftables=false
```

```
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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 2026 1 6

 2022 5 24

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7.6.3

---

7.7 Overlay

| Underlay |         | Pod    | IP |
|----------|---------|--------|----|
| VPC      | Overlay | Pod IP | IP |

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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 2023 12 25

 2022 7 6

 GitHub 

7.7.3

---

## 7.8 Overlay

| Overlay                                                            | tunnel |
|--------------------------------------------------------------------|--------|
| <ul style="list-style-type: none"><li></li><li></li><li></li></ul> |        |

### 7.8.1

| Kube-OVN                                                                     | Kubernetes Node IP                           |
|------------------------------------------------------------------------------|----------------------------------------------|
| <pre>IFACE=eth1</pre>                                                        |                                              |
| <pre>ens[a-z0-9]*,eth[a-z0-9]*</pre>                                         |                                              |
| <pre>kube-ovn-cni DaemonSet</pre>                                            |                                              |
| <pre>args: - --iface=eth1</pre>                                              |                                              |
| <pre>annotation ovn.kubernetes.io/tunnel_interface</pre>                     | <pre>annotation    iface    annotation</pre> |
| <pre>kubect1 annotate node no1 ovn.kubernetes.io/tunnel_interface=ethx</pre> |                                              |

### 7.8.2

| Kube-OVN                                                                                                                                   | IP          | tunnel     |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------|
| <ul style="list-style-type: none"><li>IP</li><li></li><li>Overlay</li></ul>                                                                |             |            |
| 1. Node                                                                                                                                    | IP          |            |
| 2. Subnet                                                                                                                                  | nodeNetwork |            |
| 3. kube-ovn-daemon                                                                                                                         | IP          | OVS        |
| 4. Pod                                                                                                                                     | nodeNetwork | Pod OVS IP |
| <pre>ovn.kubernetes.io/node_networks</pre>                                                                                                 |             |            |
| <pre>JSON    key    value    IP</pre>                                                                                                      |             |            |
| <pre>kubect1 annotate node &lt;node-name&gt; ovn.kubernetes.io/node_networks='{ "storage": "192.168.100.10", "app": "172.16.0.10" }'</pre> |             |            |
| <ul style="list-style-type: none"><li>storage IP 192.168.100.10 IP</li><li>app IP 172.16.0.10 IP</li></ul>                                 |             |            |
| 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

```
kubect1 annotate node node1 ovn.kubernetes.io/node_networks='{"storage": "10.10.10.10"}'
kubect1 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
```

Pod eth1

- 1.
- 2. IP IP
- 3. Overlay Underlay Underlay Underlay
- 4. nodeNetwork IP
- 5. Pod nodeNetwork Pod
- 6. ovn.kubernetes.io/node\_networks Pod

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🕒 2025 11 28

🕒 2025 11 28

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## 7.9 BGP

| Kube-OVN | Pods   | Subnets    | Services        | EIPs | IP | BGP  | IP | kube-ovn-speaker |
|----------|--------|------------|-----------------|------|----|------|----|------------------|
| Pod      | Subnet | annotation |                 |      |    |      |    |                  |
| EIP      | BGP    |            | VPC NAT Gateway |      |    | EIPs |    |                  |

### 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

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/kubeovn/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

• 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-multihop:

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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🕒2025 9 10

🕒2022 6 14

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7.9.8

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7.10 MetalLB Kube-OVN Underlay

MetalLB      Kubernetes      Kubernetes      Service

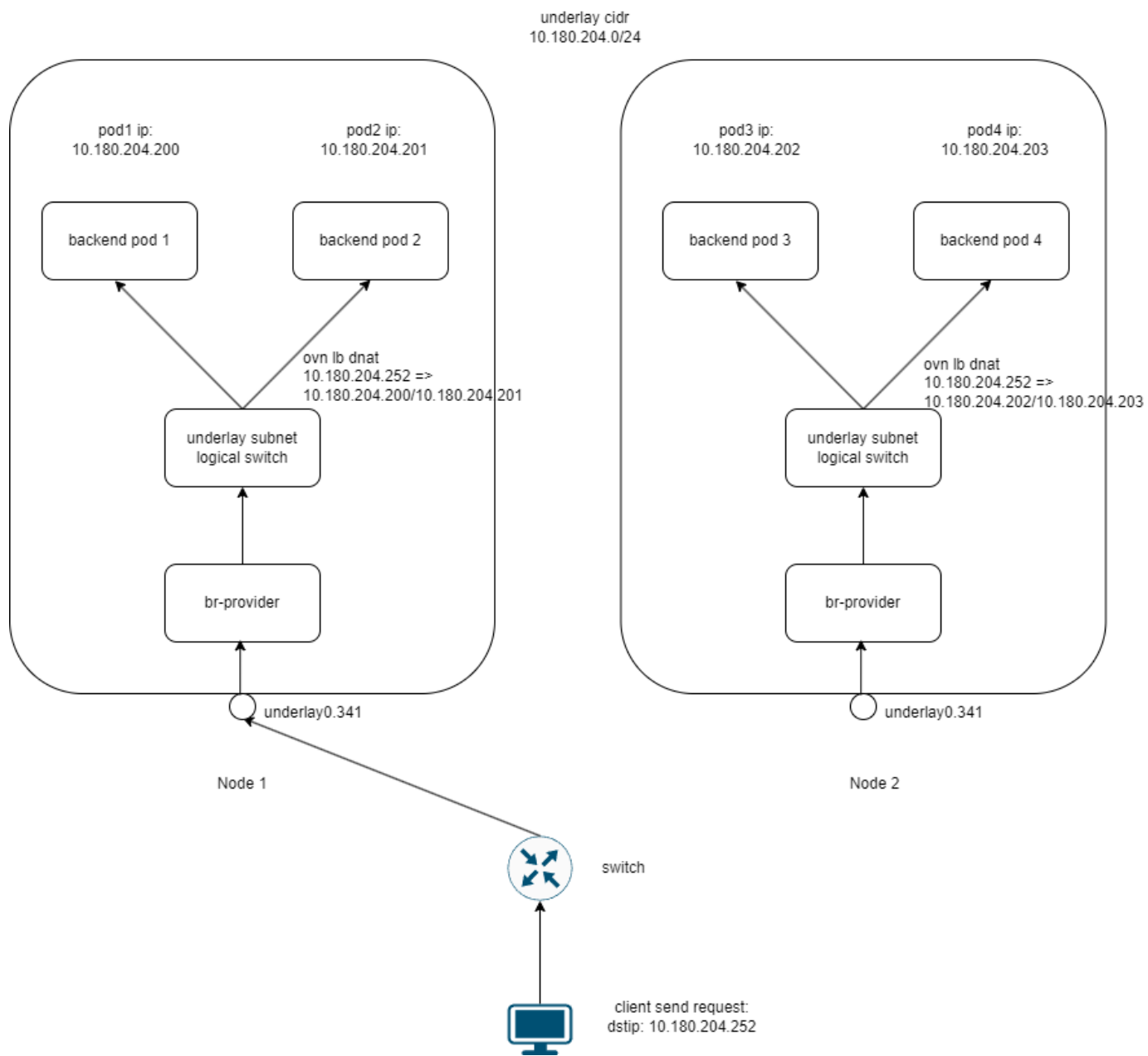
MetalLB   Kube-OVN   Underlay

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-169402624
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 |
|------------|-----------------------------------|-----------|------------------------------|

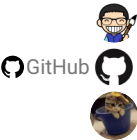
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🕒 2025 9 10

🕒 2025 4 2



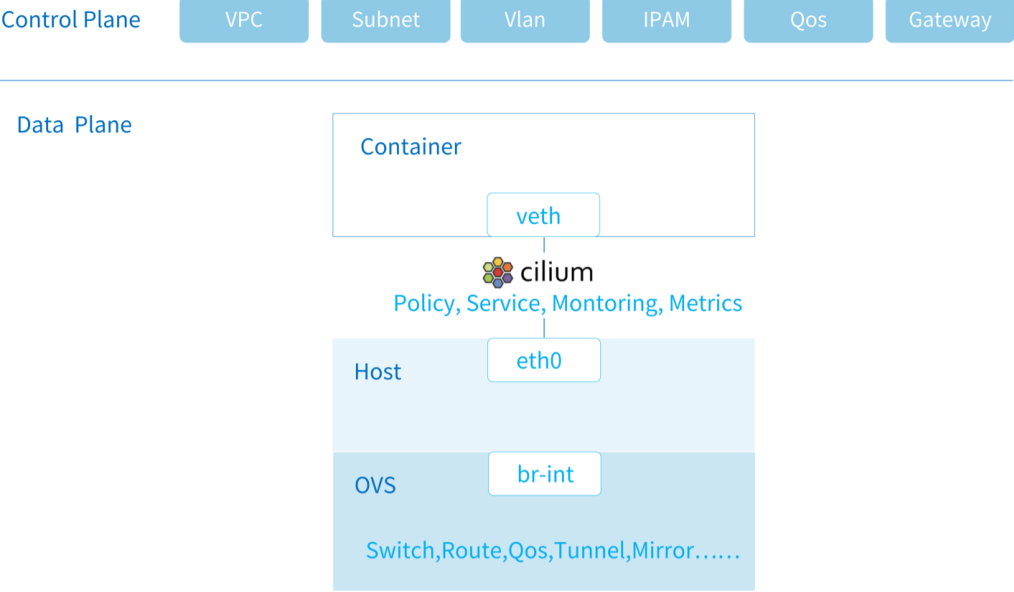
7.10.7

## 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@sha256:0612218e28288db360c63677c09fafa2d17edda4f13867bcabf87056046b33bb: 2
 cilium-operator quay.io/cilium/operator-generic:v1.10.5@sha256:2d2f730f219d489ff0702923bf24c0002cd93eb4b47ba344375566202f56d972: 2
```



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7.11.4

---

## 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> app=dynamic, pod-
dynamic-7d8d7874f5-8z2n 1/1 Running 0 28h 10.16.0.36 kube-ovn-control-plane <none> <none> app=dynamic, pod-
dynamic-7d8d7874f5-6dsg6 1/1 Running 0 7h20m 10.16.0.2 kube-ovn-control-plane <none> <none> app=dynamic, pod-
dynamic-7d8d7874f5-6dsg6 1/1 Running 0 7h20m 10.16.0.2 kube-ovn-control-plane <none> <none> app=dynamic, pod-
dynamic-7d8d7874f5-6dsg6 1/1 Running 0 7h20m 10.16.0.2 kube-ovn-control-plane <none> <none> app=dynamic, pod-
```

|                                                                |     |         |   |       |            |                 |        |        |                   |
|----------------------------------------------------------------|-----|---------|---|-------|------------|-----------------|--------|--------|-------------------|
| dynamic-7d8d7874f5-tjgtp<br>template-hash=7d8d7874f5           | 1/1 | Running | 0 | 7h46m | 10.16.0.42 | kube-ovn-worker | <none> | <none> | app=dynamic, pod- |
| label=test1-77b6764857-swq4k<br>template-hash=77b6764857       | 1/1 | Running | 0 | 3h43m | 10.16.0.12 | kube-ovn-worker | <none> | <none> | app=test1, pod-   |
| //<br>Pod<br>test-54c98bc466-mft5s<br>template-hash=54c98bc466 | 1/1 | Running | 0 | 8h    | 10.16.0.41 | kube-ovn-worker | <none> | <none> | app=test, pod-    |

## 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 | networkpolicy | Cilium | Namespace | Namespace | Namespace | Namespace | Pod |
|------------|---------------|--------|-----------|-----------|-----------|-----------|-----|
| Kube-OVN   | Kube-OVN      | k8s    | Namespace | Pod       | Pod       | Namespace | Pod |

Pod

L4

yaml L4 :

```
apiVersion: "cilium.io/v2"
kind: CiliumNetworkPolicy
metadata:
 name: "l4-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 =</h3>
 KUBERNETES listening in 443 available at tcp://10.96.0.1:443

 <h3>my name is hanhouchao!</h3>
 <h3> RequestURI=' ' /'</h3>
</body>
</html>
```

Namespace

Pod

```
kubectl exec -it -n test label-test1-77b6764857-swq4k -- 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 10000ms 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
```

Namespace

L3

L4

ping

TCP

ICMP

[L4](#)

L7

chaining

L7

Cilium

[Generic Veth Chaining](#)

[issue 12454](#)

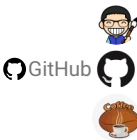
 [PDF](#)

 [Slack](#)

 [Support](#)

 2025 9 10

 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@sha256:9f6063c7bcaede801a39315ec7c166309f6a6783e98665f6693939cf1701bc17: 2
 cilium quay.io/cilium/cilium:v1.11.6@sha256:f7f93c26739b6641a3fa3d76b1e1605b15989f25d06625260099e01c8243f54c: 2
 hubble-ui quay.io/cilium/hubble-ui:v0.9.0@sha256:0ef04e9a29212925da6bdfd0ba5b581765e41a01f1cc30563cef9b30b457fea0: 1
 hubble-ui quay.io/cilium/hubble-ui-backend:v0.9.0@sha256:000df6b76719f607a9edefb9af94dfd1811a6f1b6a8a9c537cba90bf12df474b: 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/client2-547996d7d8-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 10.108.70.32 <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-71gk8 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-71gk8 to-stack FORWARDED (ICMPv4 EchoRequest)
Jul 29 03:24:25.779: kube-system/kube-ovn-pinger-msvcn <- kube-system/kube-ovn-pinger-71gk8 to-endpoint FORWARDED (ICMPv4 EchoReply)
Jul 29 03:24:25.866: kube-system/hubble-ui-7596f7ff6f-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-7596f7ff6f-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-7596f7ff6f-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-7596f7ff6f-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-71gk8 -> kube-system/kube-ovn-pinger-msvcn to-endpoint FORWARDED (ICMPv4 EchoRequest)
Jul 29 03:24:25.975: kube-system/kube-ovn-pinger-71gk8 <- 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-jgblc: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-jgblc: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-5d466d5444-4vllm:8080 (ID:15976) to-endpoint FORWARDED (TCP Flags: ACK)
Jul 28 08:00:07.324: cilium-test/client2-547996d7d8-jgblc: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-5d466d5444-4vllm:8080 (ID:15976) to-endpoint FORWARDED (TCP Flags: ACK, FIN)
Jul 28 08:00:07.324: 100.64.0.2:34927 (world) <- cilium-test/echo-same-node-5d466d5444-4vllm:8080 (ID:15976) to-stack FORWARDED (TCP Flags: ACK, FIN)
Jul 28 08:00:07.324: cilium-test/client2-547996d7d8-jgblc: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-jgblc: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-5d466d5444-4vllm:8080 (ID:15976) to-endpoint FORWARDED (TCP Flags: ACK)
Jul 28 08:00:07.340: kube-system/hubble-relay-959988db5-zc5vv:46938 (ID:53347) -> 172.18.0.2:4244 (host) to-stack FORWARDED (TCP Flags: ACK, PSH)
Jul 28 08:00:07.340: kube-system/hubble-relay-959988db5-zc5vv:46938 (ID:53347) -> 172.18.0.3:4244 (kube-apiserver) to-stack FORWARDED (TCP Flags: ACK, PSH)
Jul 28 08:00:07.340: kube-system/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: kube-system/hubble-relay-959988db5-zc5vv:46938 (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-stack FORWARDED (TCP Flags: 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: 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-stack 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-stack 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-stack 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

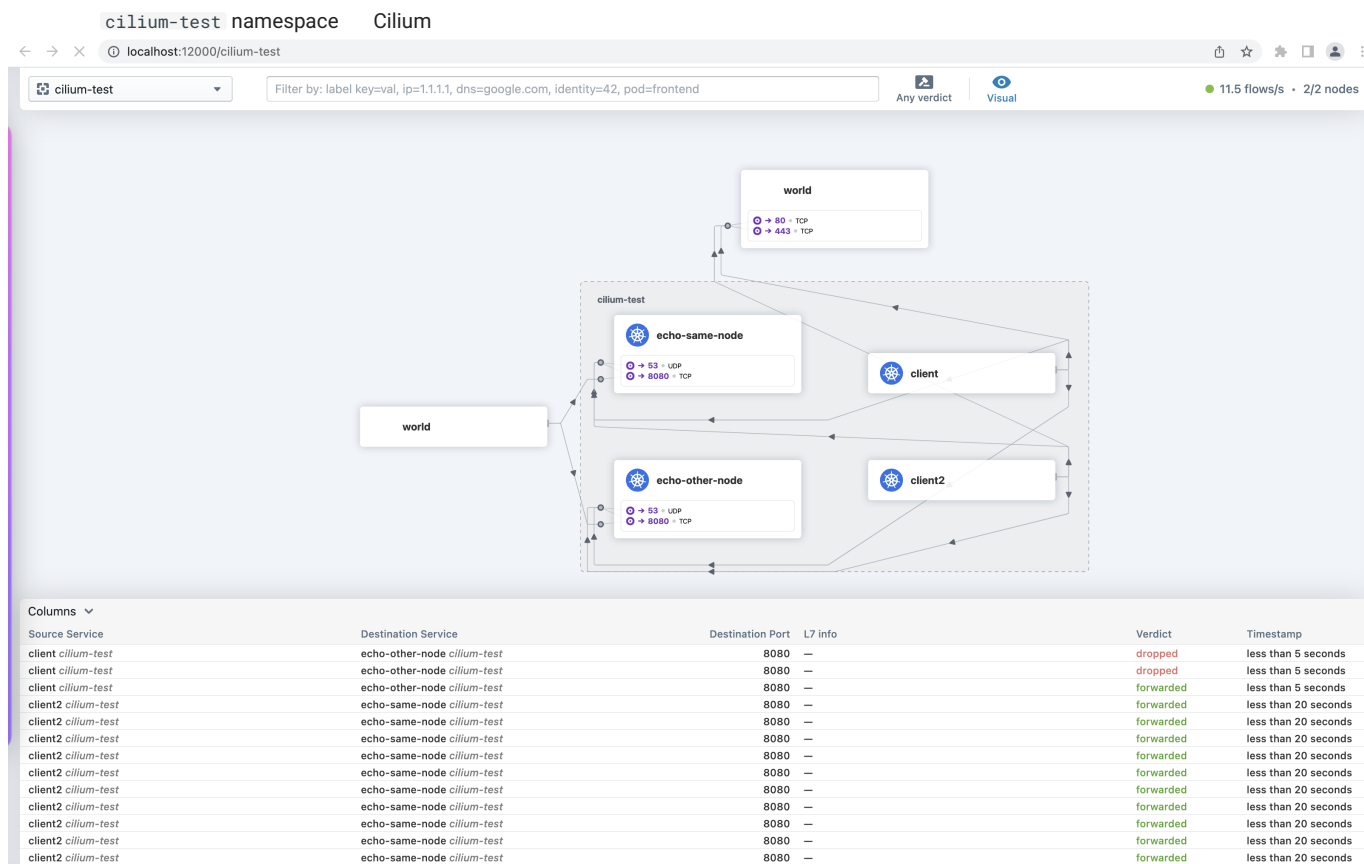
UI

cilium hubble ui

hubble-ui service

Hubble UI

http://localhost:12000 UI



## 7.13.5 Hubble

Hubble Pod Hubble

hubble.metrics.enabled :

```
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
```

 PDF

 Slack

 Support

 2023 3 26

 2022 8 2

 GitHub



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

 PDF

 Slack

 Support

 2022 6 8

 2022 5 24

 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	IP	VIP
POD	IP		VIP	IP				OVN	Switch LB	IP	VIP
Switch LB Rule			VIP							IP	OVN
• Allowed-Address-Pairs VIP  • Switch LB rule VIP  • Pod VIP IP											

7.15.1 1. Allowed-Address-Pairs VIP

	IP	Pod
• Kubernetes	Kubernetes	Kubernetes
• 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				ovn-default	true	

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 10.16.0.121 00:00:00:F0:DB:26 00:00:00:F0:DB:26 00:00:00:F0:DB:26 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 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

 PDF

 Slack

 Support

 2025 9 17

 2022 5 24



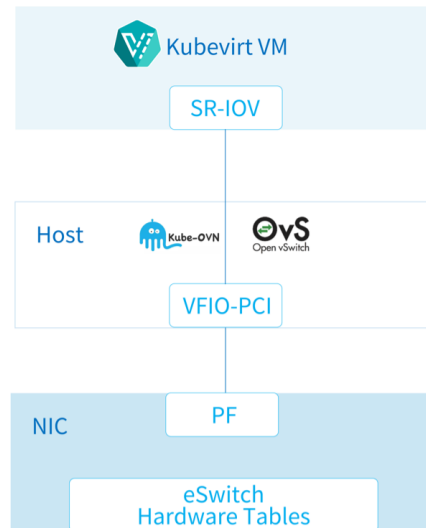
+2

7.15.4

---

## 7.16 Mellanox Offload

Kube-OVN Processing (ASAP<sup>2</sup>)      OVS OVS      CPU eSwitch      CPU OVS      Mellanox CPU      Accelerated Switching And Packet



### 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      [sriov-network-operator](#)

#### 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 08:c0:eb:74:c3:4a 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 08: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 0000:84:06.2 > /sys/bus/pci/drivers/mlx5_core/unbind
echo 0000:84:06.3 > /sys/bus/pci/drivers/mlx5_core/unbind
echo 0000:84:06.4 > /sys/bus/pci/drivers/mlx5_core/unbind
echo 0000:84:06.5 > /sys/bus/pci/drivers/mlx5_core/unbind
echo 0000:84:06.6 > /sys/bus/pci/drivers/mlx5_core/unbind
echo 0000:84:06.7 > /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 enp132s0f0np0 hw-tc-offload on
ethtool -K enp132s0f1np1 hw-tc-offload on
```

## SR-IOV VF

SR-IOV VF LAG    PF    OVS    e-switch    bond

- Active-backup
- XOR
- LACP

SR-IOV VF LAG    LAG    bond    bond PF    VF    VF    bond    PF

VF    PF    XOR    LACP    PF    VF    PF

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
```

bond

## 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: srioovdp-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
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
<a href="#">Multus-CNI</a>				
<pre>kubectl apply -f https://raw.githubusercontent.com/k8snetworkplumbingwg/multus-cni/v4.0.2/deployments/multus-daemonset-thick.yml</pre>				

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							
<pre>ENABLE_MIRROR=\${ENABLE_MIRROR:-false} HW_OFFLOAD=\${HW_OFFLOAD:-true} ENABLE_LB=\${ENABLE_LB:-false} IFACE="bond1"</pre>									
#	SR-IOV	Device Plugin	bond	IFACE	bond1	bond	IFACE	enp132s0f0np0	enp132s0f1np1

Kube-OVN

```
bash install.sh
```

VF Pod

yamlVFPod:

```
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	
<pre>ENABLE_MIRROR=\${ENABLE_MIRROR:-false} HW_OFFLOAD=\${HW_OFFLOAD:-true} ENABLE_LB=\${ENABLE_LB:-false} IFACE=""</pre>			
#	Underlay	IFACE	PF
		IFACE	K8s
			PF

Kube-OVN

```
bash install.sh
```

VF Pod

yamlVFPod:

```
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

```

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"]
 }]'
 sriov.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 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 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

 2025 9 10

 2022 5 24

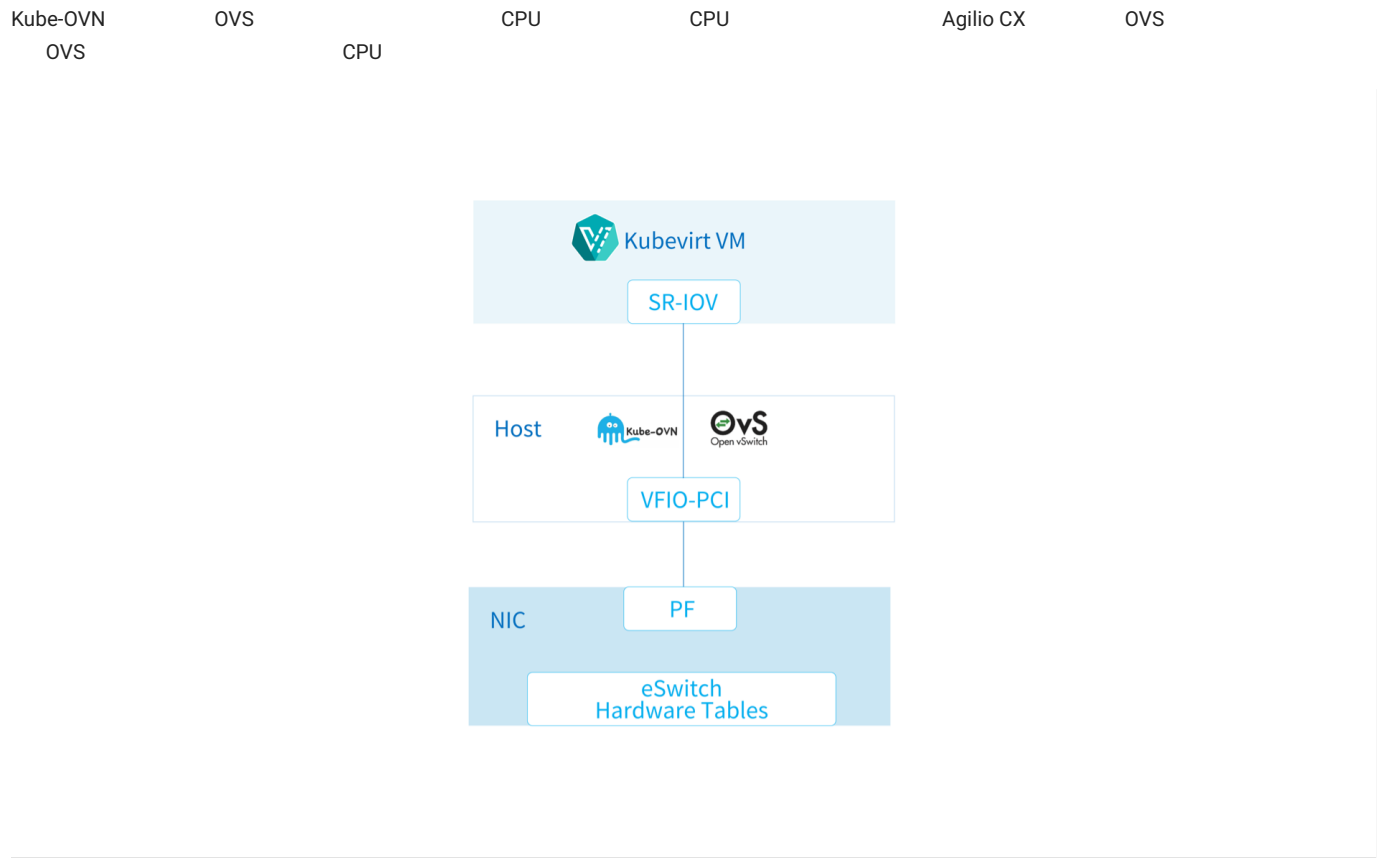
  
  
  
  


GitHub

7.16.7

---

7.17 Offload



**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}" = "scanx"]; 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": "corigine.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 corigine

corigine.com/agilio_sriov: 4
corigine.com/agilio_sriov: 4
corigine.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.yml				

NetworkAttachmentDefinition

```
apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
metadata:
 name: default
 namespace: default
 annotations:
 k8s.v1.cni.cncf.io/resourceName: corigine.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:
 corigine.com/agilio_sriov: '1'
```

```
limits:
 corigine.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

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 Support

 2025 7 21

 2022 5 24

 GitHub 

7.18 Offload

Kube-OVN	OVS		CPU	CPU		metaScale	OVS
OVS		CPU					

 **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=6.6.6.200/24
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.yml
```

## 1. NetworkAttachmentDefinition

```
apiVersion: "k8s.cni.cncf.io/v1"
kind: NetworkAttachmentDefinition
```

```

metadata:
 name: sriov-net1
 namespace: default
 annotations:
 k8s.v1.cni.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 dpctl/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=00:00:00: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/01:00:00:00:00:00),eth_type(0x0800),ipv4(frag=no), packets:5, bytes:490, used:7.434s, actions:15
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=10.16.0.14/255.192.0.0,frag=no), packets:6, bytes:588, used:7.277s, actions:ct(zone=6,nat),recirc(0x2d277)
recirc_id(0),in_port(8),packet_type(ns=0,id=0),eth(src=00:00:00:ce:cf:b9/01:00:00:00:00:00,dst=00:00:00:9d:fb:1a),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

```

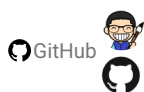

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🕒 2025 7 21

🕒 2024 5 29



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.yml
```

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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 Support

 2025 7 21

 2024 8 13

 GitHub 

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

OVS-DPDK    Kube-OVN

```
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.yml
```

NetworkAttachmentDefinition

```
apiVersion: k8s.cni.cncf.io/v1
kind: NetworkAttachmentDefinition
metadata:
 name: ovn-dpdk
 namespace: default
spec:
 config: >-
 {
 "cniVersion": "0.3.0",
 "type": "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/kubevirt/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 "hugetlbfs_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>
 <cputune>
 <shares>4096</shares>
 <vcpupin vcpu='0' cpuset='4' />
 <vcpupin vcpu='1' cpuset='5' />
 <emulatorpin cpuset='1,3' />
 </cputune>
 <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' />
 <address type='virtio-serial' controller='0' bus='0' port='1' />
 </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.cnf.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

```

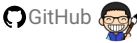
```
localhost login: root
Password:
Last login: Fri Feb 25 09:52:54 on ttyS0
```

```
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
```



🕒 2022 7 16

🕒 2022 5 24



7.20.6

---

## 7.21 OpenStack

	OpenStack	Kubernetes		OpenStack Neutron	OVN	Kube-OVN
OVN	OpenStack	Kubernetes				

### 7.21.1

OVN-IC	Kubernetes	OpenStack	Kubernetes
--------	------------	-----------	------------

- OpenStack    Kubernetes    CIDR
- 
- IP
- 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: OVN-IC      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/ovn/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

 Note

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 | 62381a21d569404aa236a5dd8712449c |
+-----+-----+-----+-----+-----+

openstack network list
+-----+-----+-----+
| ID | Name | Subnets |
+-----+-----+-----+
| cd59e36a-37db-4c27-b709-d35379a7920f | provider | 01d73d9f-fdaa-426c-9b60-aa34abbfacae |
+-----+-----+-----+

openstack subnet list
+-----+-----+-----+-----+
| ID | Name | Network | Subnet |
+-----+-----+-----+-----+
| 01d73d9f-fdaa-426c-9b60-aa34abbfacae | 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
```



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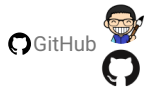
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🕒 2025 8 4

🕒 2022 5 24



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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 Support

 2025 9 10

 2023 4 18

 GitHub







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
05:13:30.328008 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)
05:13:30.559343 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)
05:13:30.560625 00:00:00:a3:f5:e2 > 00:00:00:89:d5:cc, ethertype IPv4 (0x0800), length 200: (tos 0x0, ttl 64, id 57367, offset 0, flags [DF], proto UDP (17), length 186)
10.16.0.4.53 > 10.16.0.6.43848: 2636*- 0/1/1 (158)
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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 2025 7 2

 2023 4 20

 GitHub



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 U2O

Underlay Subnet DNS U2O `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 CIDR
 - to:
 - ipBlock:
 cidr: 10.0.0.0/8 # CIDR
 ingress:
 # DNS
 - from:
 - ipBlock:
 cidr: 169.254.20.10/32
 # CIDR CIDR
 - from:
 - ipBlock:
 cidr: 10.0.0.0/8 # CIDR
```

- 169.254.20.10/32   DNS   IP
- 10.0.0.0/8   CIDR

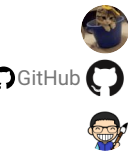
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7.24.4

## 7.25 VPC NAT

### 7.25.1

VPC	Overlay	natOutgoing	Subnet	Pod	SNAT	IP	Pod	SNAT
NAT		CIDR	IP	SNAT				

### 7.25.2

subnet.SpecnatOutgoingnatOutgoingPolicyRules

```
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

actionmatchaction, actionforwardnatforwardSNAT, natSNATnatOutgoingPolicyRules

SNAT

matchsrcIPsdstIPsIPIP match.srcIPsmatch.dstIPsCIDRIP

matchnatOutgoingPolicyRulesaction

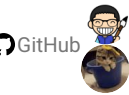
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### 7.25.3

## 8.

### 8.1

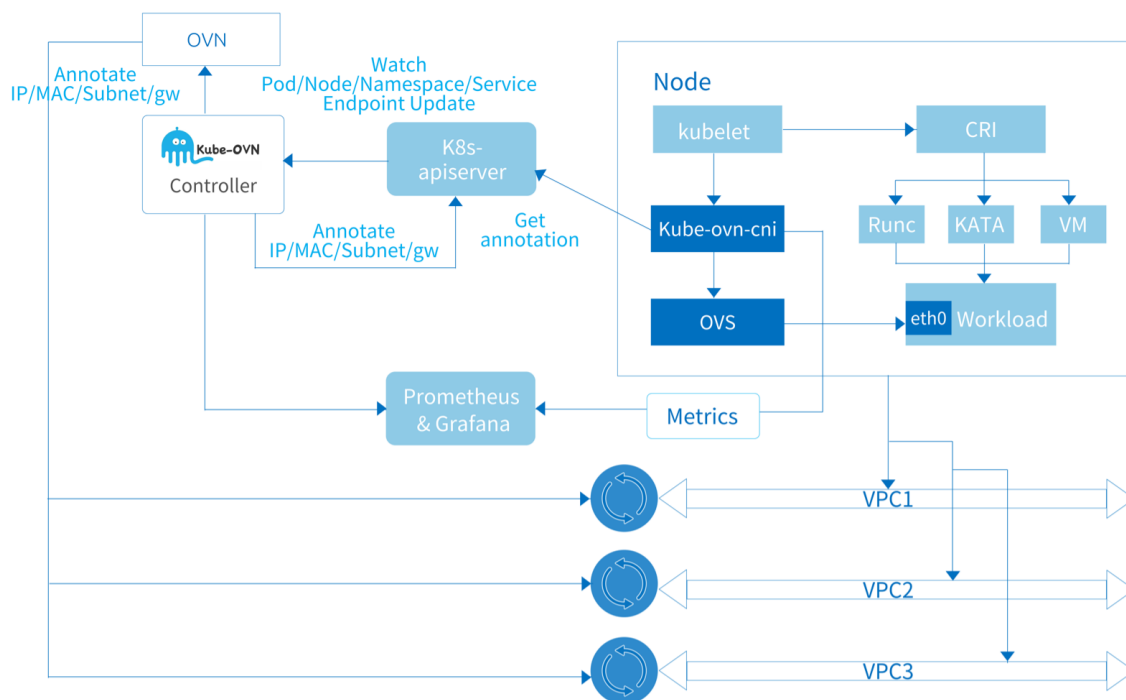
Kube-OVN

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, ovssdb, 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 Subnet Vlan ProviderNetwork

Pod kube-ovn-controller Pod IPAM ovn-central ACL kube-ovn-controller

CIDR Pod annotation annotation kube-ovn-cni

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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 2022 5 24

  
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8.1.2

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## 8.2 What's Next

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This document lists the features merged into the master branch for the next minor release.

### 8.2.1 Post-v1.14.0

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- 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 work with VPC Policy Route and ACL. [#5920](#)
- `AdminNetworkPolicy` now supports specify 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](#)
- kubectI-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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[Support](#)

 2025 12 24

 2025 9 15

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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

```
kubect1 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						
<pre>args: - --mtu=1333</pre>									

8.3.5

Kube-OVN	mirror0	tcpdump							
<pre>ENABLE_MIRROR=true</pre>									
kube-ovn-cni	DaemonSet	:							
<pre>args: - --enable-mirror=true</pre>									

8.3.6 LB

Underlay	kube-proxy ClusterIP	Service kube-proxy	OVN kube-proxy	L2 LB	ClusterIP	Service	LB
<pre>ENABLE_LB=false</pre>							
kube-ovn-controller Deployment							
<pre>args: - --enable-lb=false</pre>							

LB

Kube-OVN v1.12.0	subnet crd	spec	enableLb	Kube-OVN	LB	LB	kube-ovn-controller		
Deployment	enable-lb	load-balancer		enableLb		load-balancer	v1.12.0	enableLb	

8.3.7 NetworkPolicy

Kube-OVN	OVN	ACL	NetworkPolicy	NetworkPolicy	Cilium Chain	eBPF	NetworkPolicy	Kube-OVN
NetworkPolicy								
ENABLE_NP=false								
kube-ovn-controller Deployment								
args: - --enable-np=false								

NetworkPolicy

8.3.8 EIP 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"

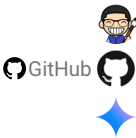
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8.3.16

8.4

Kube-OVN	Minor	Patch	Minor	OVN/OVS	API	Patch	Bug	API
----------	-------	-------	-------	---------	-----	-------	-----	-----

8.4.1

Kube-OVN backport	master, release-1.12	release-1.11	release-1.12	Bug
release-1.11	backport	Bug		

8.4.2

Minor	Patch	Bug	Bug
-------	-------	-----	-----

8.4.3 Patch

Patch	hack/release.sh				
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

---

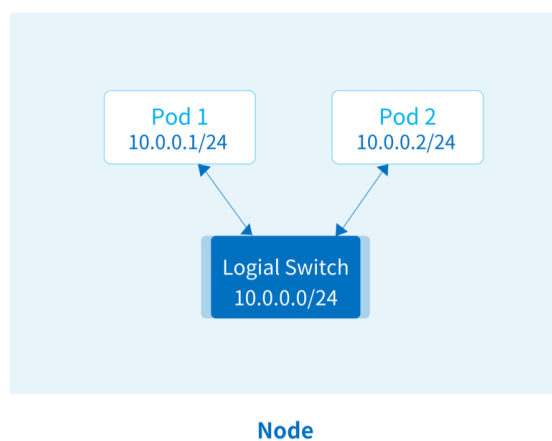
## 8.5 Underlay

---

Underlay

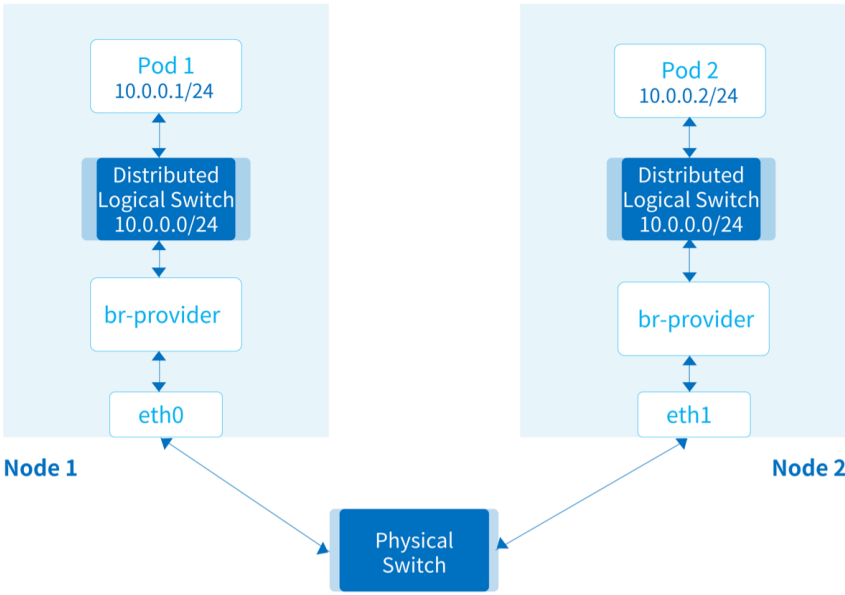
### 8.5.1

---

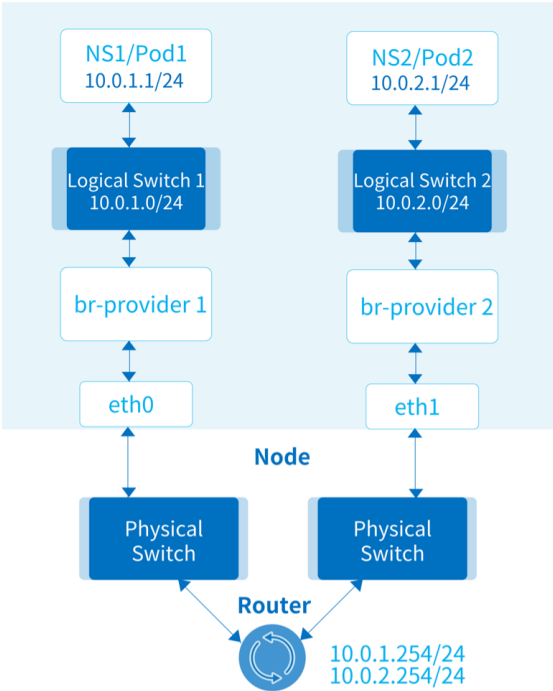


### 8.5.2

---

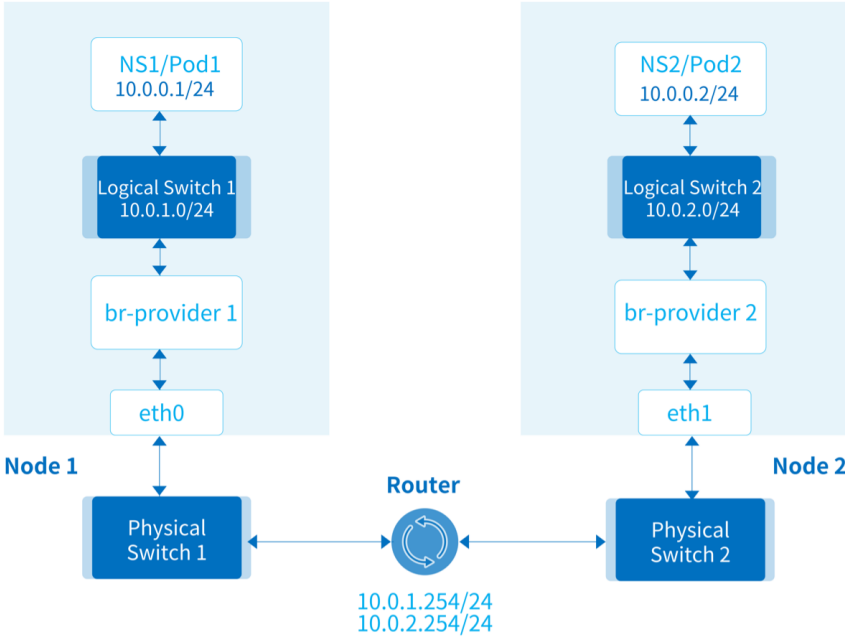


8.5.3

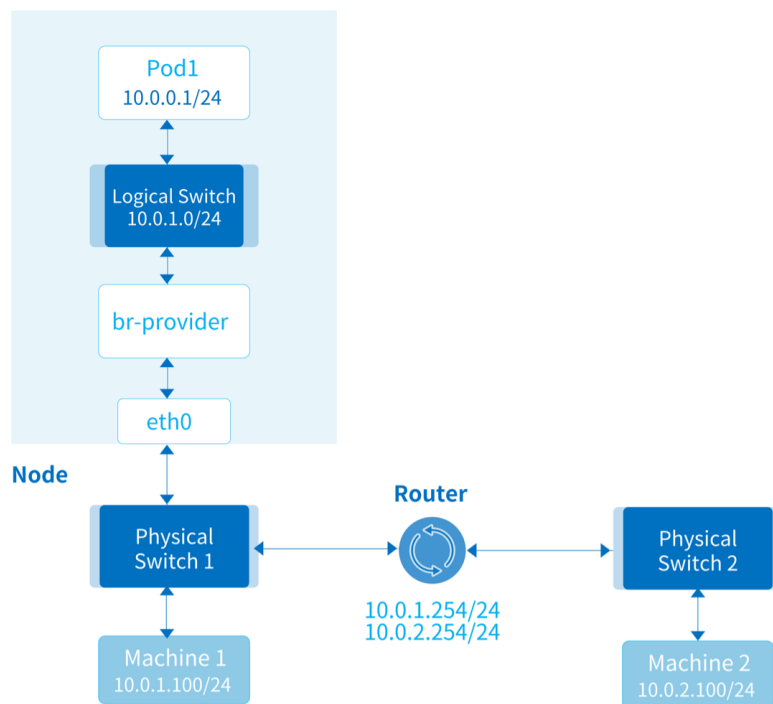


br-provider-1 br-provider-2 OVS Provider Network

8.5.4

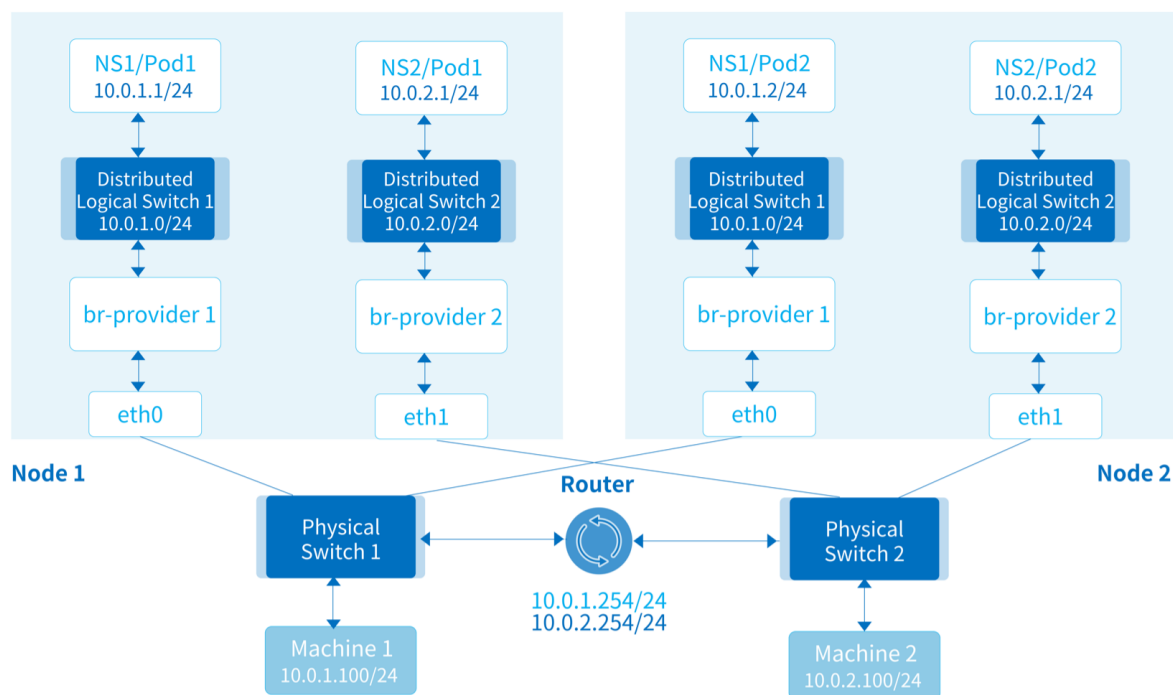


8.5.5

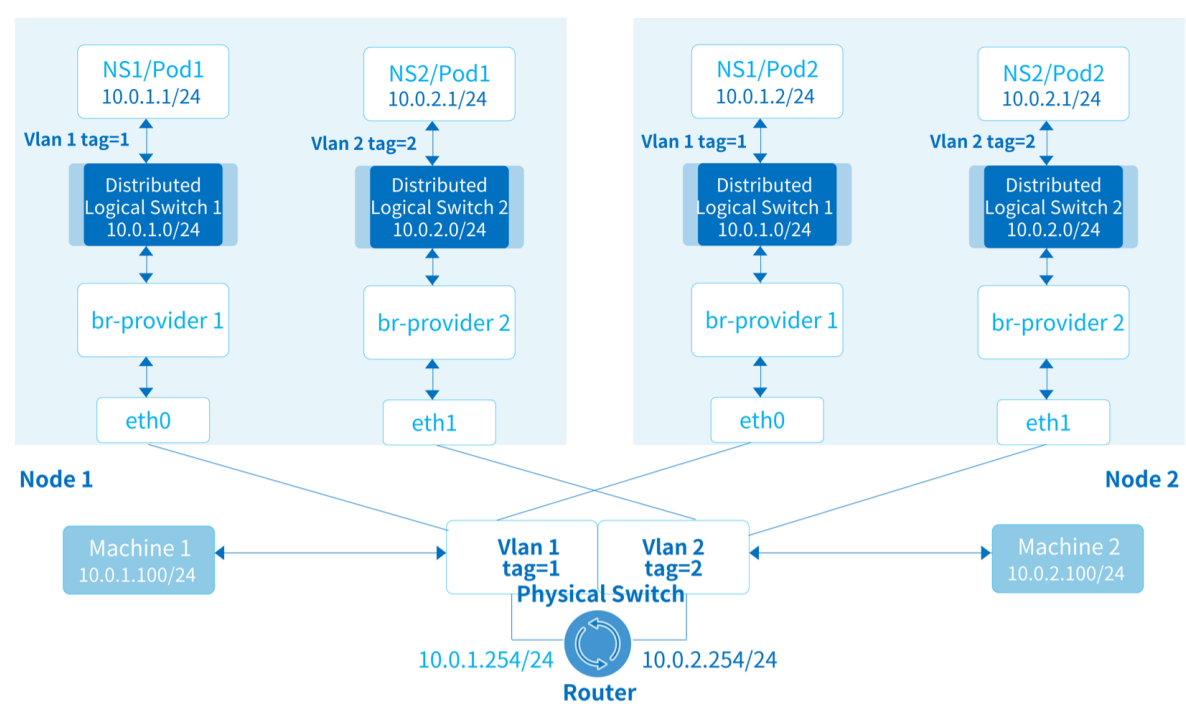


Pod

## 8.5.6 Vlan Tag



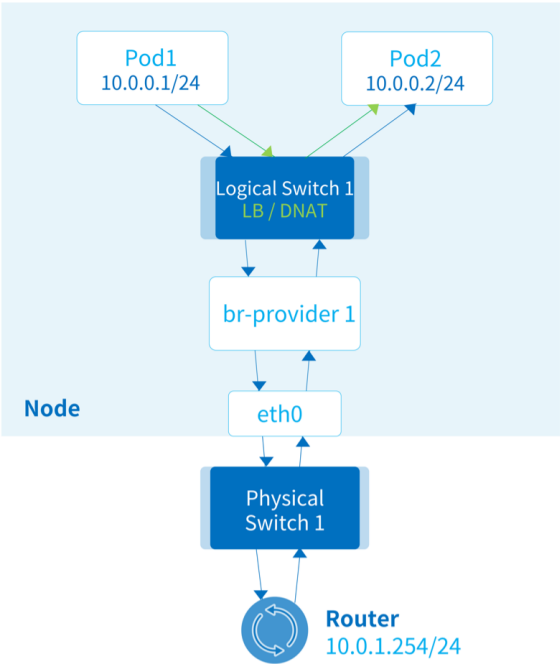
8.5.7 VLAN



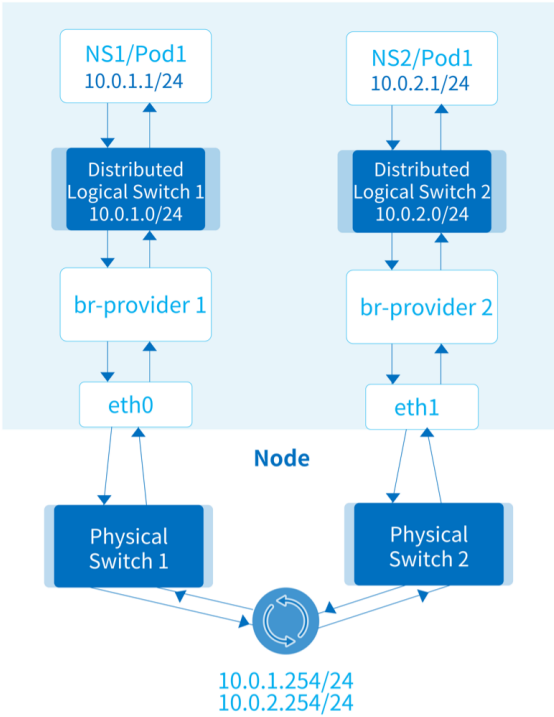
8.5.8 Pod Service IP

Kube-OVN	Kubernetes Service DNAT	Service IP	Pod Endpoint	Service IP IP	Pod MAC	Service IP MAC	MAC	MAC
----------	----------------------------	---------------	-----------------	------------------	------------	-------------------	-----	-----

Service                  Pod



Service                  Pod



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 2022 9 23

 2022 5 20

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8.5.9

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## 8.6 Iptables

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

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-LOCAL-TCP dst -j MARK --set-xmark 0x80000/0x80000	ExternalTrafficPolicy Local Service TCP			
nat	OVN-PREROUTING	-p udp -m addrtype --dst-type LOCAL -m set --match-set KUBE-NODE-PORT-LOCAL-UDP dst -j MARK --set-xmark 0x80000/0x80000	ExternalTrafficPolicy Local Service UDP			
nat	OVN-POSTROUTING	-m set --match-set ovn40services src -m set --match-set ovn40subnets dst -m mark --mark 0x4000/0x4000 -j SNAT --to-source	Service IP Overlay Pod IP	IP	kube-proxy	ipvs
nat	OVN-POSTROUTING	-m mark --mark 0x4000/0x4000 -j MASQUERADE	SNAT		--	
nat	OVN-POSTROUTING	-m set --match-set ovn40subnets src -m set --match-set ovn40subnets dst -j MASQUERADE	Pod SNAT	Service	--	
nat	OVN-POSTROUTING	-m mark --mark 0x80000/0x80000 -m set --match-set ovn40subnets-distributed-gw dst -j RETURN	ExternalTrafficPolicy Local Service Endpoint SNAT		--	
nat	OVN-POSTROUTING	-m mark --mark 0x80000/0x80000 -j MASQUERADE	ExternalTrafficPolicy Local Service Endpoint SNAT		--	
nat	OVN-POSTROUTING	-p tcp -m tcp --tcp-flags SYN NONE -m conntrack --ctstate NEW -j RETURN	Pod IP	SNAT	--	
nat	OVN-POSTROUTING	-s 10.16.0.0/16 -m set ! --match-set ovn40subnets dst -j SNAT --to-source 192.168.0.101	Pod NatOutgoing SNAT	IP	10.16.0.0/16 IP	192.168.0.101
nat	OVN-POSTROUTING	-m set --match-set ovn40subnets-nat src -m set ! --match-set ovn40subnets dst -j MASQUERADE	Pod NatOutgoing	SNAT	--	
nat	OVN-POSTROUTING	-m set --match-set ovn40subnets-nat-policy src -m set ! --match-set ovn40subnets dst -j OVN-NAT-POLICY	Pod natOutgoingPolicyRules SNAT		natOutgoingPolicyRules NAT-POLICY	OVN
nat						

	OVN- POSTROUTING	-m mark --mark 0x90001/0x90001 -j MASQUERADE --random- fully	OVN-NAT-POLICY 0x90001/0x90001	tag SNAT
nat	OVN- POSTROUTING	-m mark --mark 0x90002/0x90002 -j RETURN	OVN-NAT-POLICY 0x90002/0x90002	, tag SNAT
nat	OVN-NAT-POLICY	-s 10.0.11.0/24 -m comment --comment natPolicySubnet-net1 -j OVN-NAT-PSUBNET- aa98851157c5	10.0.11.0/24 net1 CIDR OVN-NAT- PSUBNET-aa98851157c5 natOutgoingPolicyRules	
nat	OVN-NAT- PSUBNET- xxxxxxxxxxxx	-m set --match-set ovn40natpr-418e79269dc5- src src -m set --match-set ovn40natpr-418e79269dc5- dst dst -j MARK --set-xmark 0x90002/0x90002	418e79269dc5 natOutgoingPolicyRules ID status.natOutgoingPolicyRules[index].Rule srcIPs ovn40natpr-418e79269dc5- src dstIPs ovn40natpr-418e79269dc5- dst tag 0x90002	
mangle	OVN-OUTPUT	-d 10.241.39.2/32 -p tcp -m tcp --dport 80 -j MARK --set- xmark 0x90003/0x90003	kubelet tproxy	
mangle	OVN- PREROUTING	-d 10.241.39.2/32 -p tcp -m tcp --dport 80 -j TPROXY -- on-port 8102 --on-ip 172.18.0.3 --tproxy-mark 0x90004/0x90004	kubelet tproxy	

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🕒 2025 11 20

🕒 2022 9 6

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## 8.7

### 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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 Support

 2025 6 29

 2022 5 20



 GitHub 



8.7.6

## 8.8 OVS/OVN

OVN/OVS	SDN	Kubernetes	Kube-OVN	Kube-OVN	OVN/OVS
OVN/OVS	Kube-OVN				
• <a href="#">4228eab1d7</a>	vswitchd ofport_usage				
• <a href="#">54056ea65d</a>	timer				
• <a href="#">6b4dcb311f</a>	fdb				
• <a href="#">f627b7721e</a>	hairpin	fdb			
• <a href="#">3f3e3a436f</a>	ovsdb-tool	join-cluster	Server ID		
• <a href="#">a6cb8215a8</a>	QoS				
• <a href="#">d4d76ddb2e</a>	ovsdb-tool	fix-cluster			
• <a href="#">ffd2328d4a</a>	netdev	CPU			
• <a href="#">d088c5d8c2</a>	ovs-router	kube-ipvs0			
• <a href="#">1b31f07dc6</a>					
• <a href="#">54b7678229</a>	ovs-sandbox	docker run			
• <a href="#">9ee66bd91b</a>					
• <a href="#">e889d46924</a>	Underlay	resubmit			
• <a href="#">f9e97031b5</a>	ovn-controller	Kube-OVN	localnet	GARP	
• <a href="#">78cade0187</a>	conntrack				
• <a href="#">85aa6263ad</a>	northd	DNS IP	conntrack		
• <a href="#">34dc3e3fcf</a>	lflow	lport	conntrack		
• <a href="#">a297b840c2</a>		DNAT	lsp		
• <a href="#">03e35ed9c5</a>	ovn-controller				
• <a href="#">e7d3ba53cd</a>	ACL	DNS IP	conntrack		
• <a href="#">9286e1fd57</a>					
• <a href="#">e5916eb53a</a>		lr-lb DNAT			
• <a href="#">e4e6ea9c5f</a>	BFD LRP				
• <a href="#">e76880e792</a>	northd	nb	version_compatibility		
• <a href="#">477695a010</a>	northd	localnet	lrp	arp/nd	
• <a href="#">20626ea909</a>	LB	ACL			
• <a href="#">a2d9ff3ccd</a>	Deb				

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🕒2025 9 10

🕒2022 5 24

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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

OpenVswitch3.6STTTunnel

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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🕒2025 9 10

🕒2022 6 17

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8.9.5

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## 8.10 Kube-OVN

### 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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 2025 12 12

 2022 6 21

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8.10.6

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## 8.11 Kube-OVN

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			
excludelpls	[]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 lsp virtual-ip			
logicalGateway	Bool				
disableGatewayCheck	Bool	Pod			
disableInterConnection	Bool				
enableDHCP	Bool	lsp dhcp			
dhcpV4Options	String	lsp dhcpv4_options	DHCP_Options		
dhcpV6Options	String	lsp dhcpv6_options	DHCP_Options		
enableIPv6RA	Bool	lrp	ipv6_ra_configs		
ipv6RAConfigs	String	lrp	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

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

apiVersion	String	Kubernetes	kubeovn.io/v1
kind	String	Kubernetes	Vpc
metadata	ObjectMeta	Kubernetes	
spec	VpcSpec	Vpc	
status	VpcStatus	Vpc	

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	[]VpcCondition	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	[]String	VPC	
vpcPeerings	[]String	VPC	
enableExternal	Bool		
extraExternalSubnets	[]String		
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		
vlan	[]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

QoSPolicy

apiVersion	String	Kubernetes	kubeovn.io/v1
kind	String	Kubernetes	QoSPolicy
metadata	ObjectMeta	Kubernetes	
spec	QoSPolicySpec	QoSPolicy	

QOSPOLICYSPEC

bandwidthLimitRules	QoSPolicyBandwidthLimitRules
shared	Bool
bindingType	QoSPolicyBindingType

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	[]String	BGP
holdTime	Duration	BGP
routerId	String	BGP ID
password	String	BGP
enableGracefulRestart	Bool	
extraArgs	[]String	

Route

cidr	String	CIDR
nextHopIP	String	IP

VPCNATGATEWAYSTATUS

qosPolicy	String	QoS
externalSubnets	[]String	
selector	[]String	Kubernetes Selector
tolerations	[]Toleration	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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🕒2023 2 16

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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 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	excludeIPs	Namespace excludeIPs

### 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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 2025 12 22

 2024 6 12





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8.12.7

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8.13

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8.13.1

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Bad	Good

Bad	Good
Kube-OVN1.10Kube-OVN	Kube-OVN1.10Kube-OVN



Bad	Good
wget 127.0.0.1	wget 127.0.0.1

8.13.2

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yamlyaml

Bad	Good
apiVersion: kubeovn.io/v1 kind: Subnet metadata: name: attach-subnet	apiVersion: kubeovn.io/v1 kind: Subnet metadata: name: attach-subnet

bash

Bad	Good
wget 127.0.0.1	wget 127.0.0.1

#

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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 2025 9 10

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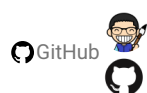
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8.13.5

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9.

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9.1