



# NVIDIA DOCA Host-based Networking Service

Guide

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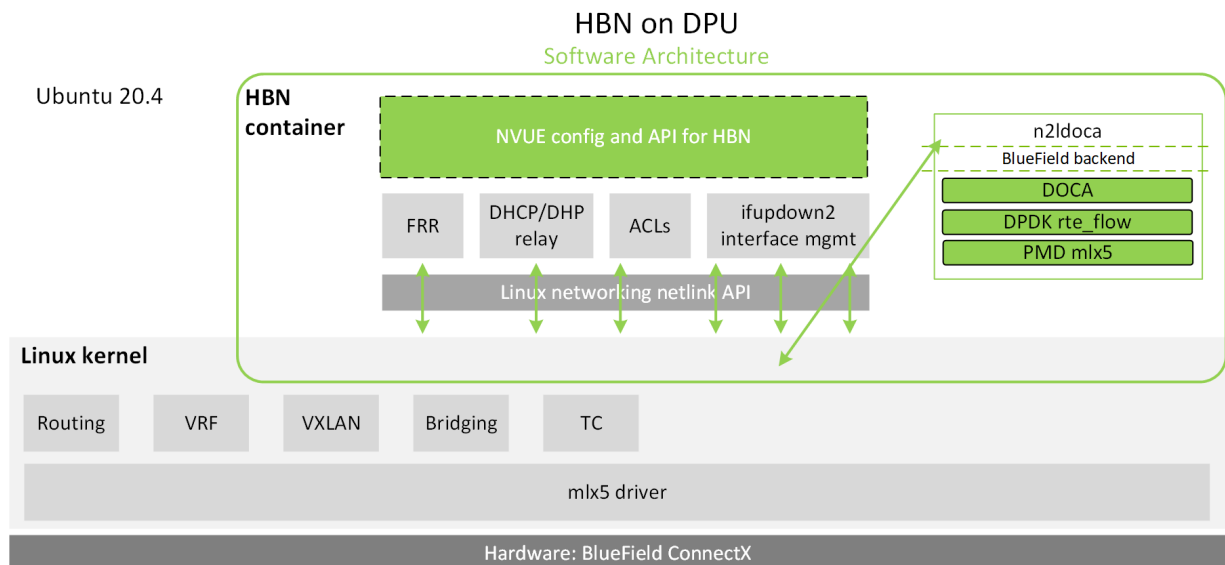


# Chapter 1. Introduction

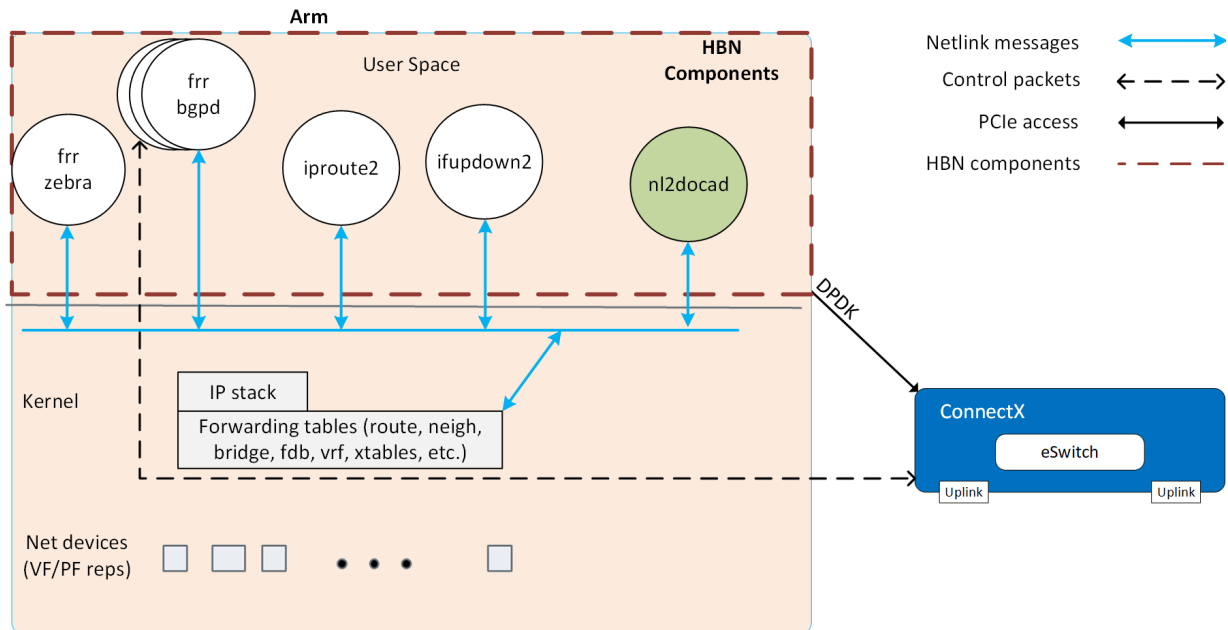
Host-based networking (HBN) is a DOCA service that enables the network architect to design a network purely on L3 protocols, enabling routing to run on the server-side of the network by using the DPU as a BGP router. The EVPN extension of BGP, supported by HBN, extends the L3 underlay network to multi-tenant environments with overlay L2 and L3 isolated networks.

The HBN solution packages a set of network functions inside a container which, itself, is packaged as a service pod to be run on the DPU. At the core of HBN is the Linux networking DPU acceleration driver. Netlink to DOCA daemon, or nl2docad, implements the DPU acceleration driver. nl2docad seamlessly accelerates Linux networking using DPU hardware programming APIs.

The driver mirrors the Linux kernel routing and bridging tables into the DPU hardware by discovering the configured Linux networking objects using the Linux Netlink API. Dynamic network flows, as learned by the Linux kernel networking stack, are also programmed by the driver into DPU hardware by listening to Linux kernel networking events.



The following diagram captures an overview of HBN and the interactions between various components of HBN.



- ▶ `ifupdown2` is the interface manager which pushes all the interface related states to kernel
- ▶ The routing stack is implemented in FRR and pushes all the control states (EVPN MACs and routes) to kernel via netlink
- ▶ Kernel maintains the whole network state and relays the information using netlink. The kernel is also involved in the punt path and handling traffic that does not match any rules in the eSwitch.
- ▶ `nl2docad` listens for the network state via netlink and invokes the DOCA interface to accelerate the flows in the DPU HW tables. `nl2docad` also offloads these flows to eSwitch.

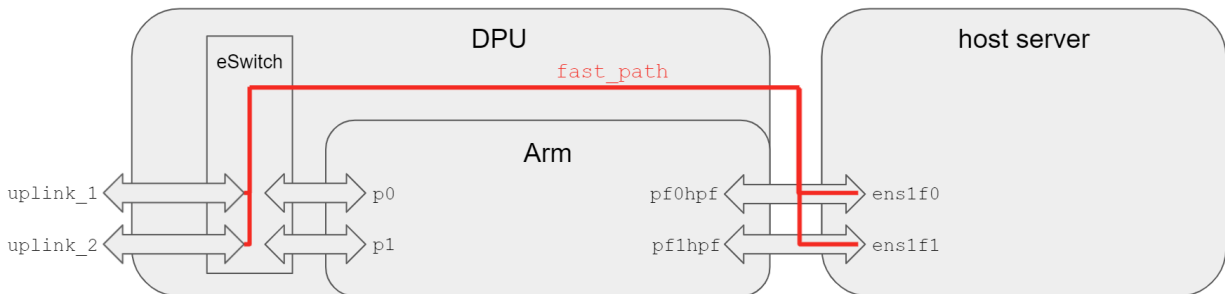
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## Chapter 2. HBN Default Deployment Configuration

The Arm Linux system on the DPU comes with a set of four interfaces or netdevices:

- ▶ Two uplinks (p0, p1)
- ▶ Two port representors (pf0hpf, pf1hpf)

As shown in the following image, the port representors are each linked with the corresponding host representatives on the host server (usually named ens1f0 and ens1f1 depending on udev rules and PCIe slot numbers).

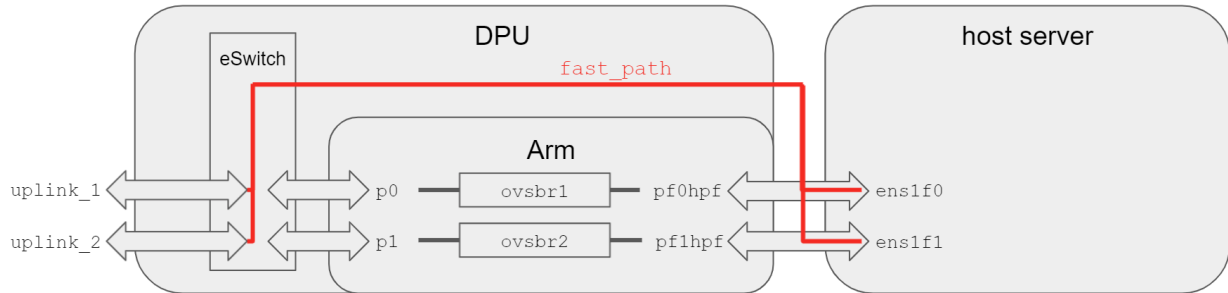


After a fresh DOCA BFB installation, the DPU comes with OVS installed and a default OVS configuration already applied.

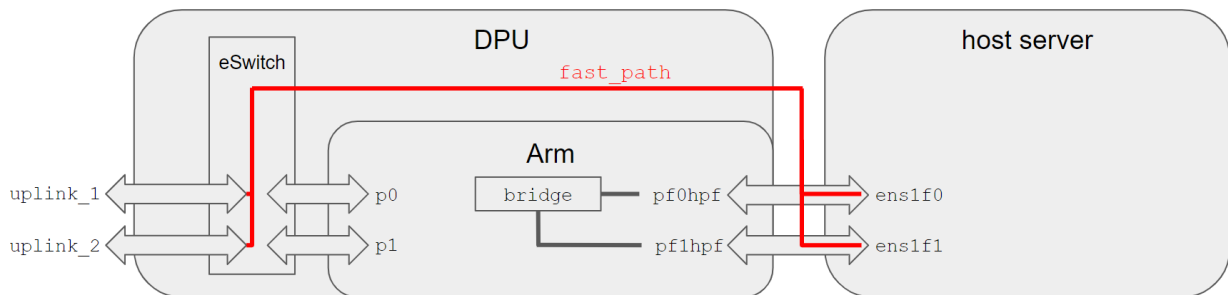
As shown in the figure below, the default configuration has two bridges:

- ▶ ovsbr1 (bridge p0 and pf0hpf)
- ▶ ovsbr2 (bridge p1 and pf1hpf)

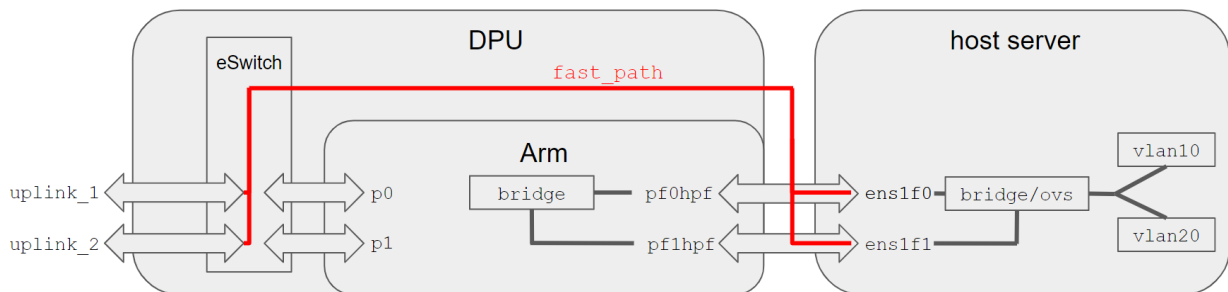
With this configuration, any packets coming to uplink\_1/p0 reaches the host server on ens1f0. Similarly, packets coming to uplink\_2 will reach ens1f1. The same is true for the transmit direction.



As seen in the following figure, the default configuration for HBN is different: There is only one bridge, and the bridge is only connected to the port representatives, pf0hpf and pf1hpf.



After applying the `mlxconfig` command (on host server or the DPU) and rebooting the host server, the following diagram represents the default HBN configuration:

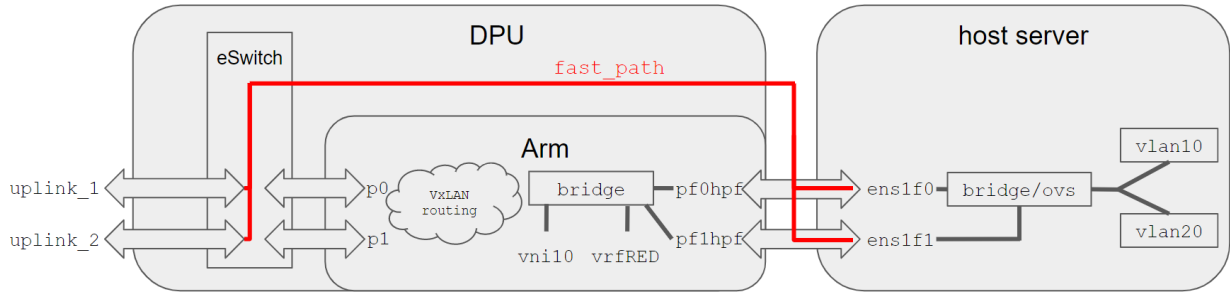


The diagram above shows the following:

- ▶ Host OS sees the DPU as the default gateway
- ▶ Host maintains per-tenant VLAN mapping
- ▶ DPU is unaware of the tenants
- ▶ DPU has tenant VLAN-VNI mapping

When, for example, a VXLAN configuration is applied to the DPU, p0/p1 reaches the bridge and thus the host server, via routing, as depicted in the following figure.





---

## Chapter 3. Service Deployment

For information about the deployment of DOCA containers on top of the BlueField DPU, refer to [NVIDIA DOCA Container Deployment Guide](#).

HBN service is available on NGC, NVIDIA's container catalog. Service-specific configuration steps and deployment instructions can be found under the service's [container page](#).

Make sure to follow the instructions in the NGC page to verify that the container is running.

---

# Chapter 4. Network Configuration

Add network interfaces and FRR configuration files on the DPU to achieve the desired configuration:

- ▶ `/etc/network/interfaces`



**Note:** Refer to [NVIDIA® Cumulus® Linux documentation](#) for more information.



**Note:** Virtual functions (VFs) can also be used in `/etc/network/interfaces` in place of PFs. After creating/removing VFs from the host server, restart the `rc-bf2-local` service using the following command:

```
systemctl restart rc-bf2-local
```

- ▶ `/etc/frr/frr.conf`



**Note:** Refer to [NVIDIA® Cumulus® Linux documentation](#) for more information.

- ▶ `/etc/frr/daemons`

---

# Chapter 5. Troubleshooting

## 5.1. Traffic Does Not Reach DPU from Host Server

Check that the uplink corresponding to the port representor is connected and in the UP state. For example, if the `p0` uplink is not cabled and is thus in NO-CARRIER, then `pf0hpf` will not receive any traffic from the host server. In this case, `pf1hpf` must be used instead for HBN configuration.

## 5.2. HBN Container Does Not Start

If the container is not starting and is not appearing in `crictl ps` output, check Kubelet logs with the following:

```
journalctl _SYSTEMD_UNIT=kubelet.service
```

If the following message appears in the logs, try rebooting the DPU to free up the huge pages resources:

```
"Failed to admit pod, unexpected error while attempting to recover from admission failure" pod="default/doca-app-hbn-hbn-01-00" err="preemption: error finding a set of pods to preempt: no set of running pods found to reclaim resources: [(res: hugepages-2Mi, q: 1073741824), ]"
```

---

# Chapter 6. BlueField Configuration

The following subsections contain instructions on different BlueField configuration files as shown in different configuration modes related to the HBN DOCA service.

## 6.1. Sample EVPN Configuration

### 6.1.1. ECMP Configuration

ECMP is implemented any time routes have multiple paths over uplinks. For example:

```
10.0.1.1 proto bgp metric 20
    nexthop via 169.254.0.1 dev p1 weight 1 onlink <<<<<via uplink p1
    nexthop via 169.254.0.1 dev p0 weight 1 onlink <<<<<via uplink p0
```

The following is a sample config which has 3 VRFs for EVPN symmetric routing, as well as corresponding L3-VNIs (vx-4001, vx-4002, vx-4003) and L2-VNIs (vx-1000, vx-1002, vx-1004, vx-1006) for EVPN bridging.

#### 6.1.1.1. Sample Interface Configuration

This file is located at /etc/network/interface.

```
auto lo
iface lo inet loopback
    address 10.10.10.200/32
    vxlan-local-tunnelip 10.10.10.200

auto vrf1
iface vrf1
    vrf-table auto

auto vrf2
iface vrf2
    vrf-table auto

auto vrf3
iface vrf3
    vrf-table auto

auto p0
iface p0

auto p1
iface p1
```

```
auto vx-1000
iface vx-1000
    vxlan-id 1000
    bridge-access 1000
    mtu 9152

auto vx-1002
iface vx-1002
    vxlan-id 1002
    bridge-access 1002
    mtu 9152

auto vx-1004
iface vx-1004
    vxlan-id 1004
    bridge-access 1004
    mtu 9152

auto vx-1006
iface vx-1006
    vxlan-id 1006
    bridge-access 1006
    mtu 9152

auto vx-1008
iface vx-1008
    vxlan-id 1008
    bridge-access 1008
    mtu 9152

auto vx-4001
iface vx-4001
    vxlan-id 4001
    bridge-access 4001
    mtu 9152

auto vx-4002
iface vx-4002
    vxlan-id 4002
    bridge-access 4002
    mtu 9152

auto vx-4003
iface vx-4003
    vxlan-id 4003
    bridge-access 4003
    mtu 9152

auto vlan1000
iface vlan1000
    address 172.16.0.2/24
    address-virtual 00:00:5e:00:01:01 172.16.0.1/24
    vlan-id 1000
    vlan-raw-device bridge
    vrf vrf1

auto vlan1002
iface vlan1002
    address 172.16.2.2/24
    address-virtual 00:00:5e:00:01:01 172.16.2.1/24
    vlan-id 1002
    vlan-raw-device bridge
    vrf vrf1

auto vlan1004
iface vlan1004
    address 172.16.4.2/24
```

```

address-virtual 00:00:5e:00:01:01 172.16.4.1/24
vlan-id 1004
vlan-raw-device bridge
vrf vrf2

auto vlan1006
iface vlan1006
address 172.16.6.2/24
address-virtual 00:00:5e:00:01:01 172.16.6.1/24
vlan-id 1006
vlan-raw-device bridge
vrf vrf2

auto vlan1008
iface vlan1008
address 172.16.8.2/24
address-virtual 00:00:5e:00:01:01 172.16.8.1/24
vlan-id 1008
vlan-raw-device bridge
vrf vrf3

auto vlan4001
iface vlan4001
vrf vrf1
vlan-raw-device bridge
vlan-id 4001

auto vlan4002
iface vlan4002
vrf vrf2
vlan-raw-device bridge
vlan-id 4002

auto vlan4003
iface vlan4003
vrf vrf3
vlan-raw-device bridge
vlan-id 4003

auto bridge
iface bridge
bridge-vlan-aware yes
bridge-ports vx-1000 vx-1002 vx-1004 vx-1006 vx-1008 vx-4001 vx-4002 vx-4003
pf0hpf pflhpf
bridge-vids 1000 1002 1004 1006 1008
bridge-pvid 1

auto pf0hpf
iface pf0hpf
bridge-pvid 1000

```

### 6.1.1.2. Sample FRR Daemons File

This file is located at `/etc/frr/daemons`.

```

zebra=yes
bgpd=yes
ospfd=no

```

### 6.1.1.3. Sample FRR Configuration

This file is located at `/etc/frr/frr.conf`.

```
!
```

```

log syslog informational
no zebra nexthop kernel enable
service integrated-vtysh-config
!
vrf vrf1
vni 4001
exit-vrf
!
vrf vrf2
vni 4002
exit-vrf
!
vrf vrf3
vni 4003
exit-vrf
!
router bgp 65535
bgp router-id 10.10.10.200
bgp bestpath as-path multipath-relax
neighbor underlay peer-group
neighbor underlay remote-as external
neighbor p0 interface peer-group underlay
neighbor p1 interface peer-group underlay
!
address-family ipv4 unicast
  redistribute connected
  neighbor underlay activate
exit-address-family
!
address-family ipv6 unicast
  redistribute connected
exit-address-family
!
address-family l2vpn evpn
  advertise-all-vni
  neighbor underlay activate
exit-address-family
!
line vty
exec-timeout 0 0
!

```

## 6.2. LAG Configuration

To configure the DPU and HBN for LAG mode, the `hbn-dpu-setup.sh` script must be run with the `--bond` argument:

```
./hnb-dpu-setup.sh --bond
```

In LAG mode, the second PF on the host will be unused. After rebooting the host server, the second PF is hidden. This step is optional but, if rebooting the host server is not performed, then the second PF must not be used.



**Note:** To create LAG on the DPU, the host server must unbind the host driver and rebind after the LAG has been setup by the HBN container.

1. Unbind the host driver from the host server:

```
echo 0000:02:00.0 > /sys/module/mlx5_core/drivers/pci/mlx5_core/unbind
echo 0000:02:00.1 > /sys/module/mlx5_core/drivers/pci/mlx5_core/unbind
```



Where 0000:02:00.0 and 0000:02:00.1 are the PCIe addresses of the BlueField uplinks. You can obtain such addresses from `lspci`, `mst status`, or `devlink dev show` commands.

2. The HBN container can be started:

```
cp doca-app-hbn.yaml /etc/kubelet.d
```

3. Once the HBN container is running, the host server must rebind the host driver:

```
echo 0000:02:00.0 > /sys/module/mlx5_core/drivers/pci/mlx5_core/bind
echo 0000:02:00.1 > /sys/module/mlx5_core/drivers/pci/mlx5_core/bind
```

You can verify that the bond mode came up properly if the following message appears in `dmesg` output without errors:

```
$ dmesg

[ 31.083529] mlx5_core 0000:03:00.0: lag map port 1:2 port 2:2 shared_fdb(1)
[ 31.200877] mlx5_core 0000:03:00.0: Operation mode is single FDB
[ 31.229390] mlx5_core 0000:03:00.0: modify lag map port 1:1 port 2:1
[ 33.264621] mlx5_core 0000:03:00.0: modify lag map port 1:2 port 2:2
[ 33.370314] mlx5_core 0000:03:00.0: modify lag map port 1:1 port 2:2
```

## 6.2.1. Sample Interface Configuration

This file is located at `/etc/network/interface`.

```
auto lo
iface lo inet loopback
    address 10.10.10.200/32
    vxlan-local-tunnelip 10.10.10.200

auto vrf1
iface vrf1
    vrf-table auto

auto vrf2
iface vrf2
    vrf-table auto

auto vrf3
iface vrf3
    vrf-table auto

auto p0
iface p0

auto p1
iface p1

auto uplink
iface uplink
    bond-slaves p0 p1
    bond-mode 802.3ad
    bond-xmit-hash-policy layer3+4
    bond-min-links 1
    bond-lacp-rate 1
    mtu 9202

auto vx-1000
iface vx-1000
    vxlan-id 1000
    bridge-access 1000
    mtu 9152

auto vx-1002
```

```
iface vx-1002
  vxlan-id 1002
  bridge-access 1002
  mtu 9152

auto vx-1004
iface vx-1004
  vxlan-id 1004
  bridge-access 1004
  mtu 9152

auto vx-1006
iface vx-1006
  vxlan-id 1006
  bridge-access 1006
  mtu 9152

auto vx-1008
iface vx-1008
  vxlan-id 1008
  bridge-access 1008
  mtu 9152

auto vx-4001
iface vx-4001
  vxlan-id 4001
  bridge-access 4001
  mtu 9152

auto vx-4002
iface vx-4002
  vxlan-id 4002
  bridge-access 4002
  mtu 9152

auto vx-4003
iface vx-4003
  vxlan-id 4003
  bridge-access 4003
  mtu 9152

auto vlan1000
iface vlan1000
  address 172.16.0.2/24
  address-virtual 00:00:5e:00:01:01 172.16.0.1/24
  vlan-id 1000
  vlan-raw-device bridge
  vrf vrf1

auto vlan1002
iface vlan1002
  address 172.16.2.2/24
  address-virtual 00:00:5e:00:01:01 172.16.2.1/24
  vlan-id 1002
  vlan-raw-device bridge
  vrf vrf1

auto vlan1004
iface vlan1004
  address 172.16.4.2/24
  address-virtual 00:00:5e:00:01:01 172.16.4.1/24
  vlan-id 1004
  vlan-raw-device bridge
  vrf vrf2

auto vlan1006
iface vlan1006
```

```

address 172.16.6.2/24
address-virtual 00:00:5e:00:01:01 172.16.6.1/24
vlan-id 1006
vlan-raw-device bridge
vrf vrf2

auto vlan1008
iface vlan1008
    address 172.16.8.2/24
    address-virtual 00:00:5e:00:01:01 172.16.8.1/24
    vlan-id 1008
    vlan-raw-device bridge
    vrf vrf3

auto vlan4001
iface vlan4001
    vrf vrf1
    vlan-raw-device bridge
    vlan-id 4001

auto vlan4002
iface vlan4002
    vrf vrf2
    vlan-raw-device bridge
    vlan-id 4002

auto vlan4003
iface vlan4003
    vrf vrf3
    vlan-raw-device bridge
    vlan-id 4003
auto bridge
iface bridge
    bridge-vlan-aware yes
    bridge-ports vx-1000 vx-1002 vx-1004 vx-1006 vx-1008 vx-4001 vx-4002 vx-4003
    pf0hpf
    bridge-vids 1000 1002 1004 1006 1008
    bridge-pvid 1

auto pf0hpf
iface pf0hpf
    bridge-pvid 1000

```

## 6.2.2. Sample FRR Daemons File

This file is located at `/etc/frr/daemons`.

```

zebra=yes
bgpd=yes
ospfd=no

```

## 6.2.3. Sample FRR Configuration

This file is located at `/etc/frr/frr.conf`.

```

!
log syslog informational
no zebra nexthop kernel enable
service integrated-vtysh-config
!
vrf vrf1
vni 4001
exit-vrf
!

```

```

vrf vrf2
vni 4002
exit-vrf
!
vrf vrf3
vni 4003
exit-vrf
!
router bgp 65535
bgp router-id 10.10.10.200
bgp bestpath as-path multipath-relax
neighbor underlay peer-group
neighbor underlay remote-as external
neighbor uplink interface peer-group underlay
!
address-family ipv4 unicast
  redistribute connected
exit-address-family
!
address-family ipv6 unicast
  redistribute connected
exit-address-family
!
address-family l2vpn evpn
  advertise-all-vni
neighbor uplink activate
exit-address-family
!
line vty
exec-timeout 0 0
!

```

## 6.3. Single VXLAN Device

With a single VXLAN device, a set of VNIs represents a single device model. The single VXLAN device has a set of attributes that belong to the VXLAN construct. Individual VNIs include VLAN-to-VNI mapping which allows users to specify which VLANs are associated with which VNIs. A single VXLAN device simplifies the configuration and reduces the overhead by replacing multiple traditional VXLAN devices with a single VXLAN device.

Users may configure a single VXLAN device automatically with NVUE, or manually by editing the `/etc/network/interfaces` file. When users configure a single VXLAN device with NVUE, NVUE creates a unique name for the device in the following format using the bridge name as the hash key: `vxlan<id>`.

This example configuration performs the following steps:

1. Creates a single VXLAN device (vxlan21).
2. Maps VLAN 10 to VNI 10 and VLAN 20 to VNI 20.
3. Adds the VXLAN device to the default bridge.

```

cumulus@leaf01:~$ nv set bridge domain bridge vlan 10 vni 10
cumulus@leaf01:~$ nv set bridge domain bridge vlan 20 vni 20
cumulus@leaf01:~$ nv set nve vxlan source address 10.10.10.1
cumulus@leaf01:~$ nv config apply

```

Alternately, users may edit the file `/etc/network/interfaces` as follows, then run the `ifreload -a` command to apply the SVD configuration.

```

auto lo
iface lo inet loopback

```

```
vxlan-local-tunnelip 10.10.10.1
auto vxlan21
iface vxlan21
    bridge-vlan-vni-map 10=10 20=20
    bridge-learning off

auto bridge
iface bridge
    bridge-vlan-aware yes
    bridge-ports pf0vf0 vxlan21 pf0hpf pflhpf
    bridge-vids 10 20
    bridge-pvid 1
```



**Note:** Users may not use a combination of single and traditional VXLAN devices.

---

# Chapter 7. Stateless ACL

The following subsections detail the stateless ACL applications and features supported by DOCA HBN Service.

## 7.1. EBTables

Only ingress ACLs—that is, bind point to ingress ports (before forwarding lookup) of FILTER|FORWARD chain—are supported.

Only legacy application is supported.

### 7.1.1. Table and Chains

- ▶ Only FILTER tables with FORWARD chain are supported (offloaded) in DPU

### 7.1.2. Match

- ▶ Source and destination MAC match with mask support
- ▶ Protocol: Ethertype
- ▶ Interface (`--in-interface`)
- ▶ VLAN match – VID and ethertype

### 7.1.3. Binding

- ▶ Only binding to physical ports is supported. That is, the `--in-interface` flag must only have physical ports (no logical interfaces).
- ▶ In the DPU, only one table is maintained for INGRESS of FILTER|FORWARD chain
- ▶ If an explicit input interface (`--in-interface`) is set in the FORWARD chain rule, the rule would be bound to the INGRESS table of the port. In the absence of any explicit interface configuration in the ebtables rules, the rule would be bound to all the ingress ports.

### 7.1.4. Actions

- ▶ Accept and drop

## 7.2. ITables/IP6Tables

Only legacy iptables applications are supported.

Only ingress ACLs—that is, bind point to ingress ports (before forwarding lookup) of FILTER|FORWARD chain—are supported.

### 7.2.1. Table and Chains

- ▶ Only FILTER tables with FORWARD chain are supported (offloaded) in the DPU

### 7.2.2. Matching

- ▶ Source and destination IPv4/IPv6 match with mask support
- ▶ Protocol
- ▶ Interface (`--in-interface`)
- ▶ TCP/UDP source and destination port (`--sport` and `--dport`)

### 7.2.3. Binding

- ▶ Only binding to physical ports is supported. That is, the `--in-interface` flag must only have physical ports (no logical interfaces).
- ▶ In the DPU, only one table is maintained for INGRESS of FILTER|FORWARD chain
- ▶ If an explicit input interface (`--in-interface`) is set in the FORWARD chain rule, the rule would be bound to the INGRESS table of the port. In absence of any explicit mention of an interface config in the iptables/ip6tables rules, the rule is bound to all the ingress ports.

### 7.2.4. Actions

- ▶ Accept and drop

## 7.3. DPDK Limitations

DPDK has limitations regarding the maintenance of the order of rules as configured by the user as illustrated in the following example.

From the Linux ACL user's perspective (ebtables/iptables/ip6tables), the ACL rules are perceived as the rules that would be hit in the same order as entered in the `policy.rules` file.

For example, assuming the following rules are entered in the `policy.rules` file in the following order.

```
-sa 10.10.10.2/32 -da 20.20.20.2/32 -sp 10 -dp 20 -p udp --- R1
-sa 10.10.10.3/32 -da 20.20.20.3/32 -sp 20 -dp 30 -p udp --- R2
```

```
-sa 10.10.10.4/32 -sp 30 -dp 40 -p udp --- R3  
-sa 10.10.10.5/32 -da 20.20.20.5/32 -sp 40 -dp 50 -p udp --- R4
```

Where:

- ▶ sa – source IP address
- ▶ da – destination IP address
- ▶ sp – source L4 port
- ▶ dp – destination L4 port

Here, the DPDK does not honour the exact ordering of these rules.



---

# Chapter 8. NVUE

This chapter assumes familiarity with [NVIDIA user experience \(NVUE\) Cumulus Linux documentation](#). The following subsections, only expand on DPU-specific aspects of NVUE.

## 8.1. NVUE Service

HBN installs NVUE by default and enables NVUE service at boot.

## 8.2. NVUE REST API

HBN enables REST API by default.

Users may run the cURL commands from the command line. Use the HBN username `nvidia` and password `nvidia`. The password of the `nvidia` user may be changed using the Linux `passwd` utility.

REST API example:

```
curl -u 'nvidia:nvidia' --insecure https://10.188.108.58:8765/nvue_v1/interface/p0
{
  "ip": {
    "address": {
      "30.0.0.1/24": {}
    }
  },
  "link": {
    "auto-negotiate": "on",
    "duplex": "full",
    "fec": "auto",
    "mac": "b8:ce:f6:a8:83:9a",
    "mtu": 9216,
    "speed": "100G",
    "state": {
      "up": {}
    }
  },
  "stats": {
    "carrier-transitions": 13,
    "in-bytes": 0,
    "in-drops": 0,
    "in-errors": 0,
    "in-pkts": 0,
    "out-bytes": 14111,
    "out-drops": 0,
    "out-errors": 0,
    "out-pkts": 161
  }
}
```

```

    },
  },
  "pluggable": {
    "identifier": "QSFP28",
    "vendor-name": "Mellanox",
    "vendor-pn": "MCP1600-C00AE30N",
    "vendor-rev": "A4",
    "vendor-sn": "MT2105VB02844"
  },
  "type": "swp"
}

```



**Note:** For information about using the NVUE REST API, refer to the [NVUE API documentation](#).

## 8.3. NVUE CLI

For information about using the NVUE CLI, refer to the [NVUE CLI documentation](#).

## 8.4. NVUE Startup Configuration File

When the network configuration is saved using NVUE, Cumulus Linux writes the configuration to the `/etc/nvue.d/startup.yaml` file.

Startup configuration is applied by following the supervisor daemon at boot time. `nvued-startup` will appear in `EXITED` state after applying the startup configuration.

```
# supervisorctl status nvued-startup
nvued-startup          EXITED      Apr 17 10:04 AM
```



**Note:** `nv config apply startup` applies the startup configuration.



**Note:** `nv config save` saves the running configuration to `startup.yaml`.

## 8.5. NVUE Troubleshooting on HBN

To check the status of the NVUE daemon, run:

```
supervisorctl status nvued
```

To restart the NVUE daemon, run:

```
supervisorctl restart nvued
```

## 8.6. NVUE Limitations

- ▶ Only commands related to `/etc/network/interfaces` or `/etc/frr/` are supported
- ▶ DHCP relay and stateless ACL configurations are not supported by NVUE

## 8.7. NVUE Interface Classification

Interface	Interface Type	NVUE Type	Comment
p0	Uplink representor	swp	Use type swp
p1	Uplink representor	swp	Use type swp
lo	Loopback	loopback	Tested with NVUE
tmfifo_net0	N/A	N/A	Managed by DPU. NVUE does not manage this.
oob_net0	N/A	N/A	Managed by DPU. NVUE does not manage this.
pf0hpf	Host representor	swp	Use type swp
pf1hpf	Host representor	swp	Use type swp
pf0vfx (where x is 0 to 255)	VF representor	swp	Use type swp
pf1vfx (where x is 0 to 255)	VF representor	swp	Use type swp
en3f0pf0sf0	SF representor	N/A	Not supported in HBN
enp3s0f0s0	SF representor	N/A	Not supported in HBN
en3f1pf1sf0	SF representor	N/A	Not supported in HBN
enp3s0f1s0	SF representor	N/A	Not supported in HBN

---

# Chapter 9. DHCP Relay on HBN

DHCP is a client server protocol that automatically provides IP hosts with IP addresses and other related configuration information. A DHCP relay (agent) is a host that forwards DHCP packets between clients and servers. DHCP relays forward requests and replies between clients and servers that are not on the same physical subnet.

HBN does not have any management entity for managing dhcrelay. Dhcrelay configuration and process must be managed by the user.

## 9.1. Configuration

HBN is a non-systemd based container. Therefore, the DHCP relay must be configured as explained in the following subsections.

### 9.1.1. Supervisord Configuration

The HBN initialization script installs default configuration files on the DPU in `/var/lib/hbn/etc/supervisor/conf.d/`. The DPU directory is mounted to `/etc/supervisor/conf.d` which achieves configuration persistence.

By default, DHCP relay is disabled. Default configuration applies to one instance of DHCPv4 relay and DHCPv6 relay.

### 9.1.2. DHCPv4 Configuration

```
[program: dhcrelay]
command = /usr/sbin/dhcrelay --nl -d -U 30.0.0.1%%p0 -i p1 1.1.1.1
autostart = true
autorestart = unexpected
startsecs = 10
startretries = 3
exitcodes = 0
stopsignal = TERM
stopwaitsecs = 10
```

Where:

Option	Description
-i	Network interface to listen on for requests and replies
-iu	Upstream network interface

Option	Description
-il	Downstream network interface
-U [address]%%ifname	Gateway IP address interface. Use %% for IP% %ifname. % is used as an escape character.
--loglevel-debug	Debug logging. Location: /var/log/syslog.

### 9.1.3. DHCPv6 Configuration

```
[program: dhcrelay6]
command = /usr/sbin/dhcrelay --nl -d -6 -l p0 -u p1
autostart = true
autorestart = unexpected
startsecs = 10
startretries = 3
exitcodes = 0
stopsignal = TERM
stopwaitsecs = 10
```

Where:

Option	Description
-l [address]%%ifname[#index]	Downstream interface. Use %% for IP%%ifname. % is used as escape character.
-u [address]%%ifname	Upstream interface. Use %% for IP%%ifname. % is used as escape character.
-6	IPv6
--loglevel-debug	Debug logging. Location: /var/log/syslog.

## 9.2. VRF Considerations

DHCP relay can be spawned inside a VRF context to handle the DHCP requests in that VRF. To achieve that, the user can follow these guidelines:

- ▶ DHCPv4 on default VRF:  
`/usr/sbin/dhcrelay --nl -i <interface> -U [address]%%<interface> <server_ip>`
- ▶ DHCPv4 on VRF:  
`/usr/sbin/ip vrf exec <vrf> /usr/sbin/dhcrelay --nl -i <interface> -U [address]%%<interface> <server_ip>`
- ▶ DHCPv6 on default VRF:  
`/usr/sbin/dhcrelay --nl -6 -l <interface> -u <interface>`
- ▶ DHCPv6 on VRF:  
`/usr/sbin/ip vrf exec <vrf> /usr/sbin/dhcrelay --nl -6 -l p0 -u p1`

## 9.3. Configuration Persistence

DPU directory /var/lib/hbn/etc/supervisor/conf.d is mounted on HBN container /etc/supervisor/conf.d/ using ea-doca-hbn/hbn/config.

This directory is sourced by supervisorctl to load services. Therefore, any further service configuration files are saved on the DPU, so they remain persistent.

Sample configuration files for DHCP relay and DHCPv6 relay are also copied to the DPU location using `doca-app-hbn.yaml`. Users must follow the guidelines to create a supervisor daemon.

## 9.4. NVUE Support

NVUE is not currently supported.

## 9.5. NVUE Troubleshooting

Supervisord has a `supervisorctl` utility which is an interface to the supervisord. Using this utility, users may start stop and create new daemons.

To get the `supervisorctl` status, run:

```
supervisorctl status
```

To restart daemon, run:

```
supervisorctl restart <daemon-name>
```

To update supervisord after a new daemon configuration file is added or any change to the existing conf file is to be sourced, run:

```
supervisorctl update
```

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