



OVS L4 Firewall

Reference Guide

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Chapter 1. Introduction

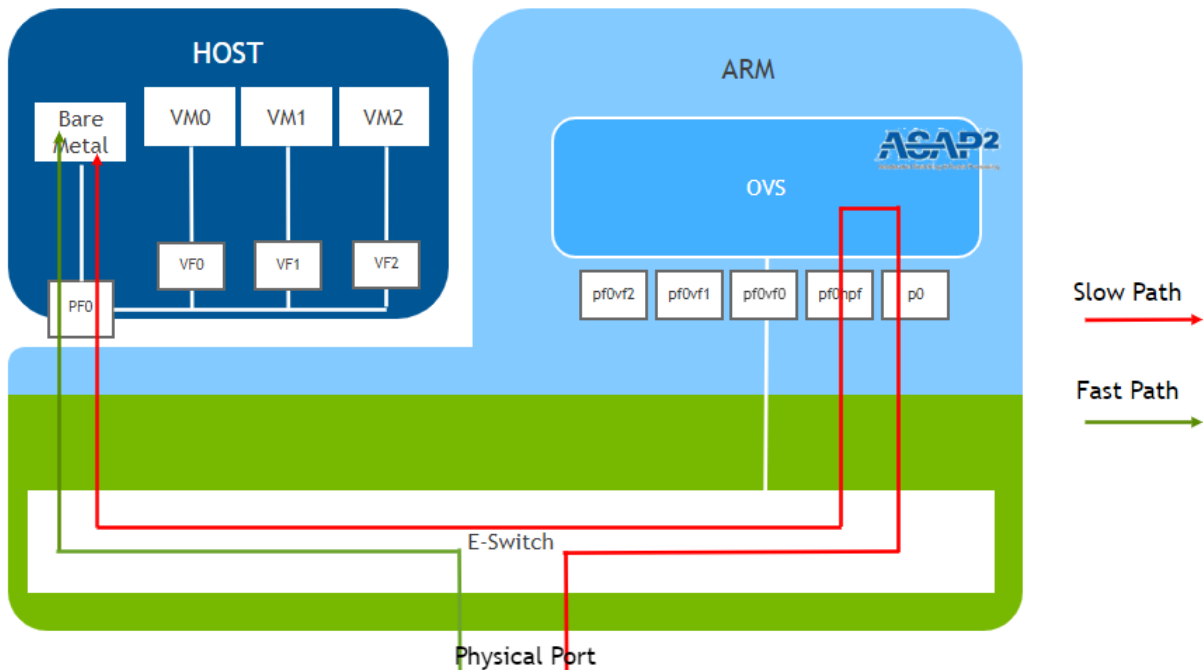
Open vSwitch (OVS) L4 firewall is used to perform basic Access Control List (ACLs) operations. It allows to identify different flows based on L3/L4 headers and execute different actions.

One of the ways to implement OVS L4 firewall is to use the connection tracking module as part of OVS. Connection tracking refers to keeping a record of all currently open connections (stateful inspection).

OVS is an open-source implementation of a virtual switch software layer which resides in a server and supports different switching capabilities. For more information on OVS, please refer to the official documentation for [Open vSwitch](#).

Chapter 2. System Design

The following diagram illustrates packet flow on an NVIDIA® BlueField® DPU connect to the host.



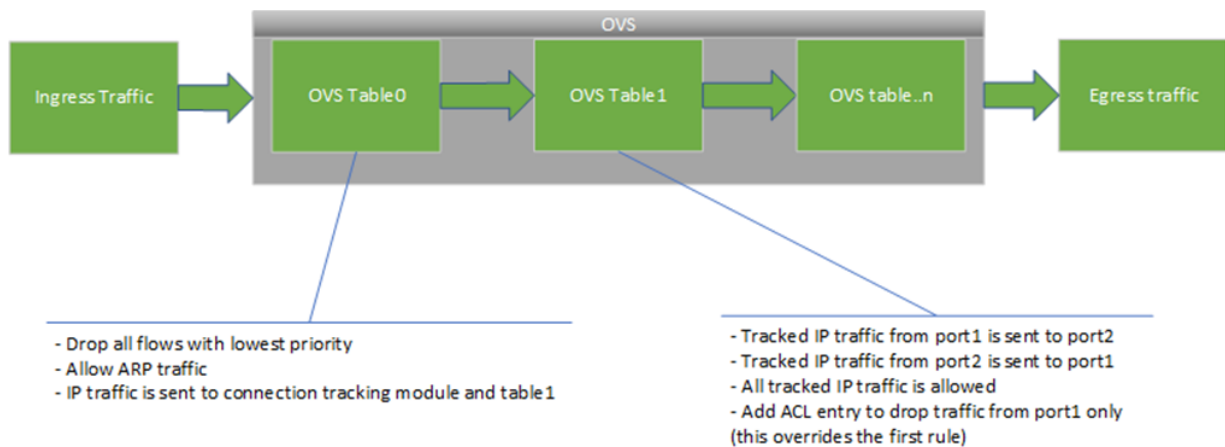
Packet flow steps:

1. Packet is received from physical port on the DPU. If the packet has no match in the e-switch flow table, it is sent to the Arm's `p0`.
2. According to OVS, the packet is directed to its destination. If OVS has no rule for where to send the packet, it is sent to `pf0hpf` (host representor).
3. `pf0hpf` is associated with `pf0` on the host. The packet is sent from `pf0hpf` on the Arm to `pf0` on the host.
4. The host processes the packet and responds with a packet to the Arm. OVS learns the packet and adds a rule into OVS table. Now ASAP2 adds the same rule to the e-switch.

5. When the next packet from the same flow is sent to the DPU through the physical port, it hits the e-switch flow table and is then passed to its destination.

Chapter 3. Application Architecture

The following diagram illustrates a packet's flow in different OVS tables.



Chapter 4. DOCA Libraries

N/A

Chapter 5. Configuration Flow



Note: The script that implements all these configuration steps is explained under [Running Application](#).

1. Add `table0` entry with priority 1 and action `drop`.
The lowest priority entry to drop all flows if no other match.
2. Add `table0` entry with priority 10 for ARP traffic with action `normal` (forward).
All ARP traffic will be forwarded.
3. Add `table0` entry with priority 100 for IP traffic with action `ct` (connection tracking) and forward to OVS `table1`.
All IP traffic will be set for connection tracking and sent to OVS `table1`.
4. Add `table1` entry for IP and tracked traffic from `port1` with action `port2`.
All tracked IP traffic from `port1` will be sent to `port2`.
5. Add `table1` entry for IP and tracked traffic from `port2` with action `port1`.
All tracked IP traffic from `port2` will be sent to `table1`.
At this point, all IP traffic is tracked by OVS connection tracking module.
6. Add ACL entry to `table1` to drop all tracked IP traffic from `port1`.



Note: You should delete configuration 4 since it creates a conflict with this configuration.

Traffic from `port1` should be blocked, while traffic from `port2` remains allowed.

Chapter 6. Running Application

1. Please refer to the [NVIDIA DOCA Installation Guide for Linux](#) for details on how to install BlueField related software.
2. Running application on BlueField:

- ▶ Using the script.

- ▶ To configure L4 OVS firewall, run the script with flags `-s/--start`:

```
/opt/mellanox/doca/applications/l4_ovs_firewall/bin/l4_ovs_firewall.sh -s
```

Or:

```
/opt/mellanox/doca/applications/l4_ovs_firewall/bin/l4_ovs_firewall.sh --start
```

- ▶ To revert the OVS configuration and delete the OVS firewall, run the script with `-d/--destroy`:

```
/opt/mellanox/doca/applications/l4_ovs_firewall/bin/l4_ovs_firewall.sh -d
```

Or:

```
/opt/mellanox/doca/applications/l4_ovs_firewall/bin/l4_ovs_firewall.sh --destroy
```

- ▶ Manually:

- a). Configure the OVS switch, ports, and enable OVS.

```
ovs-vsctl del-br ovsbr1
ovs-vsctl del-br ovsbr2
ovs-vsctl add-br ovsbr1
ovs-vsctl add-port ovsbr1 p0
ovs-vsctl add-port ovsbr1 pf0hpf
ovs-vsctl set Open_vSwitch . other_config:hw-offload=true
systemctl restart openvswitch
systemctl enable openvswitch
```

- b). Configure OVS L4 Firewall rules as detailed in section [Configuration Flow](#).

```
ovs-ofctl add-flow ovsbr1 table=0,priority=1,action=drop
ovs-ofctl add-flow ovsbr1 table=0,priority=10,arp,action=normal
ovs-ofctl add-flow ovsbr1 "table=0,priority=100,ip,ct_state=-trk,actions=ct(table=1)"
ovs-ofctl add-flow ovsbr1 "table=1,in_port=2,ip,ct_state=+trk,action=ct(commit),1"
ovs-ofctl add-flow ovsbr1 "table=1,in_port=1,ip,ct_state=+trk,action=drop"
```

Chapter 7. References

- ▶ `/opt/mellanox/doca/applications/l4_ovs_firewall/bin/l4_ovs_firewall.sh`

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