Contents

Introduction

Ping packet test is commonly used test to troubleshoot connectivity issues. This document will illustrate a systematic approach for using ping test to check the Network Convergence System 6000 (NCS6K) slow forwarding packet.

Prerequisites

Requirements

Readers of this document should have knowledge of these topics:

- Basic IP routing.
- XR operating system.

Components Used

This document is created for NCS6K platform.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Background Information

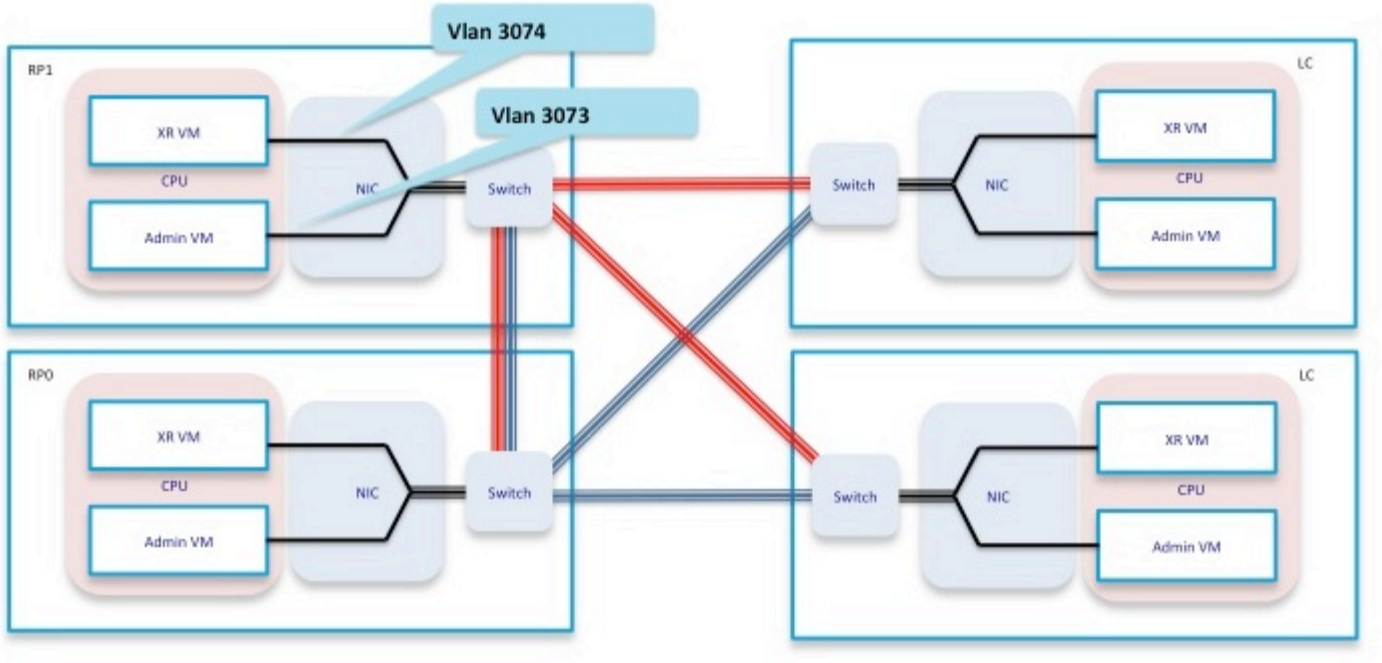
There is a key difference between NCS6K and traditional IOS-XR platform: NCS6K utilizes virtualization technology to build up the system. Each node, Routing Processor (RP) or Line Card (LC), may run several Vitual Machines (VM) like system admin VM, IOS-XR VM1, IOS-XR VM2 etc, which combined to together create a fully functional XR node. Following figure shows an example where RP and LC run one IOS-XR VM:

Figure 1

There is a control ethernet network to connect RPs and LCs. The control plane traffic between RPs and LCs will pass through this control ethernet network. Since this is a virtulization environment, questions like how these packet are delivered to specific VM and how the Nicantic (NIC) in RP or LC knows a packet is destined to them?

In a nutshell, VLANs are used to differentiate traffic of different VMs and this process is done by NIC. Figure 2 shows how NIC will deliver VLAN 3074 traffic to IOS-XR VM, and VLAN 3073 traffic to Admin VM.

Figure 2

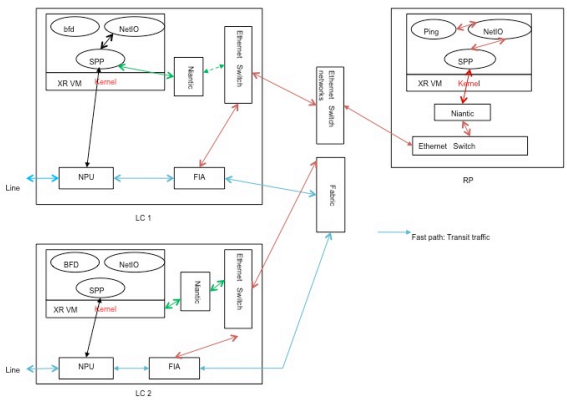


Putting these forwarding component together, you get a simplified forwarding path for ping test scenario as shown in figure 3.

When doing a ping test from RP, packets take the following forwarding path inside the box:

RP_PING <—> RP_NETIO <—> RP_SPP <—> RP_Linux_Kernel_Socket <—> Switch <—> LC_FIA <—> LC_NPU (Include PSE, PLIM_ASIC) <—> Line

Figure 3



Verify

For rest of the document, a scenario where a ping would be initiated from the RP will be taken as an example. The ping would be initiated to a directly connected host on Te0/0/0/2/0. Following steps will show a step by step approach to verify the path of this ping packet.

```
RP/0/RP0/CPU0:NCS6k-Deploy#show ip interface brief

Interface                      IP-Address      Status                Protocol
Bundle-Ether671                10.67.2.2       Up                    Up
Bundle-Ether672                10.67.3.2       Down                  Down
Loopback0                      10.17.17.17     Up                    Up
MgmtEth0/RP0/CPU0/0            10.7.54.11      Up                    Up
TenGigE0/0/0/2/0               10.67.1.2       Up                    Up
TenGigE0/0/0/2/1               unassigned      Up                    Up
TenGigE0/0/0/2/2               unassigned      Up                    Up
TenGigE0/0/0/2/3               unassigned      Up                    Up
TenGigE0/0/0/2/4               unassigned      Up                    Up
TenGigE0/0/0/2/5               unassigned      Down                  Down
[snip]

RP/0/RP0/CPU0:NCS6k-Deploy#show run interface Ten 0/0/0/2/0
interface TenGigE0/0/0/2/0
 ipv4 address 10.67.1.2 255.255.255.252
 load-interval 30

RP/0/RP0/CPU0:NCS6k-Deploy#ping 10.67.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.67.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 5/6/7 ms
```

1. **"show IPv4 traffic" counter on RP node, will show how many Internet Control Message Protocol (ICMP) echos have been sent out and how many ICMP reply have returned.**`RP/0/RP0/CPU0:NCS6k-Deploy#show ipv4 traffic`

```
IP statistics:
  Rcvd:  1495334 total, 80112 local destination
         0 format errors, 0 bad hop count
         23 unknown protocol, 0 not a gateway
         0 security failures, 0 bad source, 0 bad header
         133207 with options, 0 bad, 0 unknown
  Opts:  0 end, 0 nop, 0 basic security, 0 extended security
         0 strict source rt, 0 loose source rt, 0 record rt
         0 stream ID, 0 timestamp, 133207 alert, 0 cipso
  Frags: 0 reassembled, 0 timeouts, 0 couldn't reassemble, 0 fragments received
         0 fragmented, 0 fragment count, 0 fragment max drop
  Bcast: 0 sent, 0 received
  Mcast: 1361652 sent, 1376283 received
   Drop: 0 encapsulation failed, 237 no route, 0 too big
   Sent: 1437435 total

ICMP statistics:
  Sent: 0 admin unreachable, 63 network unreachable
        8 host unreachable, 0 protocol unreachable
        16 port unreachable, 0 fragment unreachable
        0 time to live exceeded, 0 reassembly ttl exceeded
        24 echo request, 30024 echo reply
        0 mask request, 0 mask reply
```

```
        0 parameter error, 0 redirects
        30131 total
  Rcvd: 0 admin unreachable, 21 network unreachable
        0 host unreachable, 0 protocol unreachable
        0 port unreachable, 0 fragment unreachable
        0 time to live exceeded, 0 reassembly ttl exceeded
        30024 echo request, 15 echo reply
        0 mask request, 0 mask reply
        0 redirect, 0 parameter error
        0 source quench, 0 timestamp, 0 timestamp reply
        0 router advertisement, 0 router solicitation
        30063 total, 0 checksum errors, 0 unknown
```

2. **Check Network Input Output (NETIO) component.**Next step is to check RP FINT NETIO chain counter. You have to see the "OUT" counter of IPv4 node in netio chain. If it increments, it means packets have reached NETIO component and are being sent out from NETIO component.**Check initial NETIO counter value.**

```
RP/0/RP0/CPU0:NCS6k-Deploy#sh netio chains FINT loc 0/rp0/cpu0 | in Stats
<Protocol number> (name)  Stats
<6> (fint_n2n)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
<10> (clns)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
<12> (ipv4)   Stats IN: 2788 pkts, 115373 bytes; OUT: 2816 pkts, 117933 bytes
<13> (mpls)   Stats IN: 16482 pkts, 2467508 bytes; OUT: 0 pkts, 0 bytes
<18> (lpts)   Stats IN: 47234 pkts, 10381065 bytes; OUT: 0 pkts, 0 bytes
<19> (ipv6)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
<30> (ipv4_preroute)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
<32> (ipv6_preroute)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
<34> (fint_proto_tp)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
<36> (l2transport)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes


Initiate 10 ping packets.
RP/0/RP0/CPU0:NCS6k-Deploy#ping  10.67.1.1 coun 10
Type escape sequence to abort.
Sending 10, 100-byte ICMP Echos to 10.67.1.1, timeout is 2 seconds:
!!!!!!!!!!
Success rate is 100 percent (10/10), round-trip min/avg/max = 4/7/8 ms

Check NETIO counter again. You would see increment of 10 packets.
RP/0/RP0/CPU0:NCS6k-Deploy#sh netio chains FINT  loc 0/rp0/cpu0 | in Stats
<Protocol number> (name)  Stats
<6> (fint_n2n)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
<10> (clns)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
<12> (ipv4)   Stats IN: 2788 pkts, 115373 bytes; OUT: 2826 pkts, 118933 bytes
<13> (mpls)   Stats IN: 16482 pkts, 2467508 bytes; OUT: 0 pkts, 0 bytes
<18> (lpts)   Stats IN: 47234 pkts, 10381065 bytes; OUT: 0 pkts, 0 bytes
<19> (ipv6)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
<30> (ipv4_preroute)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
<32> (ipv6_preroute)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
<34> (fint_proto_tp)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
<36> (l2transport)   Stats IN: 0 pkts, 0 bytes; OUT: 0 pkts, 0 bytes
```

You can also use KornShell (ksh) command "show_netio_fwder_stats -g" to check if inject/punt counter increments or not. **Note**: In production environment, there may be other background traffic which makes it hard to check if ping packets reached this component or not. As a workaround, you can use large number of packets with timeout 0 : "ping x.x.x.x count 10000 time 0" and check if the counter increments suddenly or has a spike.**Check initial counter value.**

```
RP/0/RP0/CPU0:NCS6k-Deploy#run show_netio_fwder_stats -g
RECEIVE STATISTICS SUMMARY:
rx_pkts: 2224455
```

```
punt_pkts: 2224447
ingress_total_drops: 8
TRANSMIT STATISTICS SUMMARY:
inject_pkts: 2077319
tx_pkts: 2058041
egress_total_drops: 2
RECEIVE STATISTICS DETAILS:
Rx Pkt type stats:
  lpts_pkts: 2220753
Rx Listener tag stats:
  ipv4: 1116092
  ipv6: 658627
  clns: 112549
  ipv4_l: 286252
  raw4: 23
  raw6: 43984
  ospf_mc4: 45
  ospf_mc6: 2
  udp4: 7
  tcp4: 405
  isis: 2767
Rx Punt reason stats:
  IFIB: 2220753
Rx Drop stats:
  null_fint_ifh_drops: 8
  ingress_total_drops: 8
TRANSMIT STATISTICS DETAILS:
Tx Pkt type stats:
  ipv4: 2852
  mpls: 42647
  osi: 78760
  ipv4_preroute: 1339401
  ipv6_preroute: 613659
Tx Protocol Id stats:
  clns: 78760
  ipv4: 2852
  mpls: 42647
  ipv4_preroute: 1339401
  ipv6_preroute: 613659
Tx Drop stats:
  invalid_queue_drops: 2
  hdr_init_drops: 2
  egress_total_drops: 2
```

Initiate 10 ping packets.

```
RP/0/RP0/CPU0:NCS6k-Deploy#ping  10.67.1.1 coun 10
Type escape sequence to abort.
Sending 10, 100-byte ICMP Echos to 10.67.1.1, timeout is 2 seconds:
!!!!!!!!!!
Success rate is 100 percent (10/10), round-trip min/avg/max = 3/4/7 ms
```

Check counter again to check to se increment of 10 packets.

```
RP/0/RP0/CPU0:NCS6k-Deploy#run show_netio_fwder_stats -g
RECEIVE STATISTICS SUMMARY:
rx_pkts: 2224465
punt_pkts: 2224457
ingress_total_drops: 8
TRANSMIT STATISTICS SUMMARY:
inject_pkts: 2077332
tx_pkts: 2058051
egress_total_drops: 2
RECEIVE STATISTICS DETAILS:
Rx Pkt type stats:
```

```
  lpts_pkts: 2220763
Rx Listener tag stats:
  ipv4: 1116102
  ipv6: 658627
  clns: 112549
  ipv4_l: 286252
  raw4: 23
  raw6: 43984
  ospf_mc4: 45
  ospf_mc6: 2
  udp4: 7
  tcp4: 405
  isis: 2767
Rx Punt reason stats:
  IFIB: 2220763
Rx Drop stats:
  null_fint_ifh_drops: 8
  ingress_total_drops: 8
TRANSMIT STATISTICS DETAILS:
Tx Pkt type stats:
  ipv4: 2865
  mpls: 42647
  osi: 78760
  ipv4_preroute: 1339401
  ipv6_preroute: 613659
Tx Protocol Id stats:
  clns: 78760
  ipv4: 2865
  mpls: 42647
  ipv4_preroute: 1339401
  ipv6_preroute: 613659
Tx Drop stats:
  invalid_queue_drops: 2
  hdr_init_drops: 2
  egress_total_drops: 2
RP/0/RP0/CPU0:NCS6k-Deploy#
```

3. **Check SPP component.**Use SPP CLI to see if packet reached SPP or not.**Check initial counter value.**

```
RP/0/RP0/CPU0:NCS6k-Deploy#sh spp node-counters
0/0/CPU0:
pdma/rx
               slice1 high pkts:              10
--------------------------------
pdma/tx
                slice1 low pkts:              10
--------------------------------
panini/classify
      forwarded to spp clients:               10
--------------------------------
client/inject
        pkts injected into spp:               10
--------------------------------
client/punt
               punted to client:              10
--------------------------------

0/RP0/CPU0:
panini/classify
      forwarded to spp clients:           22070
--------------------------------
client/inject  pkts injected into spp:            4640
--------------------------------
```

```
socket/rx
                  ce low pkts:              45
           mgmt interface pkts:           22025
------------------------------
socket/tx
                       ce pkts:              45
           mgmt interface pkts:            4595
------------------------------
client/punt punted to client:           22070
------------------------------

Initiate 100 ping packets.
RP/0/RP0/CPU0:NCS6k-Deploy#ping  10.67.1.1 count 100
Type escape sequence to abort.
Sending 100, 100-byte ICMP Echos to 10.67.1.1, timeout is 2 seconds:
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!! Success rate is 100 percent (100/100), round-trip
min/avg/max = 3/3/8 ms
Check counter again to see increment of 100 packets.

RP/0/RP0/CPU0:NCS6k-Deploy#sh spp node-counters
0/0/CPU0:
pdma/rx
              slice1 high pkts:              10
------------------------------
pdma/tx
               slice1 low pkts:              10
------------------------------
panini/classify
      forwarded to spp clients:              10
------------------------------
client/inject
        pkts injected into spp:              10
------------------------------
client/punt
              punted to client:              10
------------------------------

0/RP0/CPU0:
panini/classify
      forwarded to spp clients:           22172
------------------------------
client/inject   pkts injected into spp:            4740
------------------------------
socket/rx
                  ce low pkts:             145
           mgmt interface pkts:           22027
------------------------------
socket/tx
                       ce pkts:             145
           mgmt interface pkts:            4595
------------------------------
client/punt punted to client:           22172
------------------------------
```

4. **Use tcpdump tools to dump packet from Linux kernel component.** From the output below, under NCS6K XR VM ksh, you can see several sub interfaces:

```
RP/0/RP0/CPU0:NCS6008-SJ#
RP/0/RP0/CPU0:NCS6008-SJ#run
Tue Jun 24 10:51:51.972 UTC
[xr-vm_node0_RP0_CPU0:/]$
[xr-vm_node0_RP0_CPU0:/]$ ifconfig -a
eth-vf1   Link encap:Ethernet  HWaddr 46:91:EE:A5:48:A8
          inet6 addr: fe80::4491:eeff:fea5:48a8/64 Scope:Link
```

```
          UP BROADCAST RUNNING MULTICAST  MTU:9700  Metric:1
          RX packets:518403076C3 errors:0 dropped:0 overruns:0 frame:0 TX packets:969599306
errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:138405352234
(128.9 GiB) TX bytes:242828863250 (226.1 GiB) eth-vf1.514 Link encap:Ethernet HWaddr
4C:4E:35:B6:63:68 inet6 addr: fe80::4e4e:35ff:feb6:6368/64 Scope:Link UP BROADCAST RUNNING
MULTICAST MTU:9700 Metric:1 RX packets:13547000 errors:0 dropped:0 overruns:0 frame:0 TX
packets:116957 errors:0 dropped:10 overruns:0 carrier:0 collisions:0 txqueuelen:0 RX
bytes:623478135C3 (594.5 MiB) TX bytes:26876899 (25.6 MiB) eth-vf1.3073 Link encap:Ethernet
HWaddr 4C:4E:35:B6:63:69 inet addr:192.0.0.4 Bcast:192.255.255.255 Mask:255.0.0.0 inet6
addr: fe80::4e4e:35ff:feb6:6369/64 Scope:Link UP BROADCAST RUNNING MULTICAST MTU:9700
Metric:1 RX packets:102364757 errors:0 dropped:0 overruns:0 frame:0 TX packets:100689507
errors:0 dropped:3 overruns:0 carrier:0 collisions:0 txqueuelen:0 RX bytes:29925046692
(27.8 GiB) TX bytes:7562528012 (7.0 GiB) eth-vf1.3074 Link encap:Ethernet HWaddr
4E:41:50:00:10:01 inet addr:172.0.16.1 Bcast:172.255.255.255 Mask:255.0.0.0 inet6 addr:
fe80::4c41:50ff:fe00:1001/64 Scope:Link UP BROADCAST RUNNING MULTICAST MTU:9700 Metric:1 RX
packets:402491385 errors:0 dropped:0 overruns:0 frame:0 TX packets:350389778 errors:0
dropped:6 overruns:0 carrier:0 collisions:0 txqueuelen:0 RX bytes:100599198478 (93.6 GiB)
TX bytes:96834116492 (90.1 GiB) lo Link encap:Local Loopback inet addr:127.0.0.1
Mask:255.0.0.0 inet6 addr: ::1/128 Scope:Host UP LOOPBACK RUNNING MTU:16436 Metric:1 RX
packets:1029861486 errors:0 dropped:0 overruns:0 frame:0 TX packets:1029861486 errors:0
dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:0 RX bytes:201624257033 (187.7 GiB)
TX bytes:201624257033 (187.7 GiB)
```

eth-vf1.514 is used for communication with Mgmtehter interface but you cannot not see IPv4 address. Mgmtether interface in XR VM relies on IP stack of IOS-XR instead of IP stack in Linux.**ether-vf1.3073** is used for communication with Admin VM.**eher-vf1.3074** is used for XR VM related control plane traffic. Ping test packet will pass through this sub-interface (using Linux network protocol stack). Tcpdump associated with Linux has lot of options on how to dump interesting traffic. In addition, you can use tcpdump tools to sniff Secure Domain Router (SDR) control plane traffic (vlan 3074) or sniff other traffic like Inter Process Communication (IPC) communication in vlan 3073.

```
xr-vm_node0_RP0_CPU0:/]$ tcpdump -i eth-vf1.3074 -XX -vv
tcpdump: listening on eth-vf1.3074, link-type EN10MB (Ethernet), capture size 65535 bytes
01:49:21.798386 IP (tos 0x6,ECT(0), ttl 1, id 0, offset 0, flags [DF], proto UDP (17),
length 340)
    172.0.16.1.10150 > 239.255.0.4.10150: [bad udp cksum ab2a!] UDP, length 312
        0x0000:  0100 5e7f 0004 4e41 5000 1001 0800 4506  ..^...NAP.....E.
        0x0010:  0154 0000 4000 0111 cc8e ac00 1001 efff  .T..@...........
        0x0020:  0004 27a6 27a6 0140 ad56 abcd abcd 0000  ..'.'..@.V......
        0x0030:  0000 0280 f502 0000 0000 0000 0000 0000  ................
        0x0040:  0000 0000 0000 7856 3412 0128 0204 0000  ......xV4..(....
        0x0050:  0000 5508 0100 0100 0000 3c25 2600 0000  ..U.......<%&...
        0x0060:  0000 d007 0000 0000 0000 ffff 0000 0000  ................
        0x0070:  0000 0000 0000 0000 0000 0000 0000 0000  ................
        0x0080:  0000 0000 0000 4800 0000 0200 0000 0000  ......H.........
        0x0090:  0000 8800 0000 0000 0000 0000 0000 0000  ................
        0x00a0:  0000 0100 0000 0000 0000 0000 0000 0000  ................
        0x00b0:  0000 0000 0000 c2ca 0031 0000 0000 0000  .........1......
        0x00c0:  0000 0000 0000 0000 0000 5508 0000 6510  ..........U...e.
        0x00d0:  0000 ed53 4c00 0000 0000 0000 0000 0000  ...SL...........
        0x00e0:  0000 0000 0000 0000 0000 0000 0000 6264  ..............bd
        0x00f0:  7863 0000 0000 0000 0000 0000 0000 0000  xc..............
        0x0100:  0000 0000 0000 0000 0000 0000 0000 0000  ................
        0x0110:  0000 0100 0000 0000 0000 0000 0000 30ff  ..............0.
        0x0120:  0002 0000 0000 0000 0000 0000 0000 0000  ................
        0x0130:  0000 0000 0000 0000 0000 0000 0000 0000  ................
        0x0140:  0000 0000 0000 0000 0000 0c00 0000 0000  ................
        0x0150:  0000 0000 0000 0000 0000 0000 0000 0000  ................
        0x0160:  0000                                     ..
01:49:21.799167 IP (tos 0x6,ECT(0), ttl 64, id 0, offset 0, flags [DF], proto UDP (17),
length 380)
    172.0.0.1.8197 > 172.0.16.1.8197: [udp sum ok] UDP, length 352
        0x0000:  4e41 5000 1001 4e41 5000 0001 0800 4506  NAP...NAP.....E.
```

```
        0x0010:  017c 0000 4000 4011 d168 ac00 0001 ac00  .|..@.
        0x0040:  0000 0000 0000 7856 3412 0128 0204 0000  ......xV4..(....
        0x0050:  0000 5508 0100 0100 0000 3d25 2600 0000  ..U.......=%&...
        0x0060:  0000 d007 0000 0000 0000 ffff 0000 0000  ................
        0x0070:  0000 0000 0000 0000 0000 0000 0000 0000  ................
        0x0080:  0000 0000 0000 4800 0000 0200 0000 0000  ......H.........
        0x0090:  0000 8800 0000 0000 0000 0000 0000 0000  ................
        0x00a0:  0000 0100 0000 0000 0000 0000 0000 0000  ................
        0x00b0:  0000 0000 0000 c2ca 0031 0000 0000 0000  .........1......
        0x00c0:  0000 0000 0000 0000 0000 5508 0000 6510  ..........U...e.
        0x00d0:  0000 ee53 4c00 0000 0000 0000 0000 0000  ...SL...........
        0x00e0:  0000 0000 0000 0000 0000 0000 0000 6264  ..............bd
        0x00f0:  7863 0000 0000 0000 0000 0000 0000 0000  xc..............
        0x0100:  0000 0000 0000 0000 0000 0000 0000 0000  ................
        0x0110:  0000 0100 0000 0000 0000 0000 0000 30ff  ..............0.
        0x0120:  0002 0000 0000 0000 0000 0000 0000 0000  ................
        0x0130:  0000 0000 0000 0000 0000 0000 0000 0000  ................
        0x0140:  0000 0000 0000 0000 0000 0c04 0000 0000  ................
        0x0150:  0000 0000 0000 0000 0000 0000 0000 0000  ................
        0x0160:  0000                                     ..
01:49:21.802982 IP (tos 0x6,ECT(0), ttl 64, id 0, offset 0, flags [DF], proto UDP (17),
length 380)
    172.0.0.1.8197 > 172.0.16.1.8197: [udp sum ok] UDP, length 352
        0x0000:  4e41 5000 1001 4e41 5000 0001 0800 4506  NAP...NAP.....E.
        0x0010:  017c 0000 4000 4011 d168 ac00 0001 ac00  .|..@.@..h......
        0x0020:  1001 2005 2005 0168 672f abcd abcd 0000  .......hg/......
        0x0030:  0000 3c80 f502 0000 0000 0000 0000 0000  ..<.............
        0x0040:  0000 0000 0000 7856 3412 0411 0008 0000  ......xV4.......
        0x0050:  0000 5508 0000 0100 0000 3d25 2600 0000  ..U.......=%&...
        0x0060:  0000 d007 0100 0000 0000 ffff 0000 0000
```

[snip]**Note**: Since it is VM scenario, the traffic sent to VM may be encapsulated with VM interface address in the outer header so that this traffic can reach the VM interface.
The above packet dump is actually was encapsulated with UDP packet header with source/destination 172.0.16.1, which is eth-vf1.3074 ip address in IOS-XR VM. **Note**: The captures taken are to demonstrate the approach and do not have Internet Control Message Protocol (ICMP) traffic.

5. **Checking FIA component on line card.Check initial counter value.**

```
RP/0/RP0/CPU0:NCS6k-Deploy#sh controllers fia statistics instance 1 loc 0/0/cpu0

FIA Statistics Rack: 0, Slot: 0, Asic instance: 1

FIA Rx (To Fabric) Statistics.
------------------------------------------------------------------------ Input Pkt counters
Pkts Bytes Rx pkts from pse : 250 53000 Rx pkts from switch : 993528 349564509 bcast pkts
from switch : 0 mcast pkts from switch : 993278 ucast pkts from switch       :
250
    Rx pkts enqueued(IQM)            :              500             86500
    Rx pkts dequeued(IQM)            :              500             86500
    Rx pkts sent to fabric           :              500

Cell counters:
    Data cells sent to fabric        :              500             86500
    Control cells sent to fabric     :     183039783411

Drop counters:
    Rx burst error drops(NBI)        :                0
    Rx error drops(Switch)           :                0
    Rx error drops(pse)              :                0
    Rx pkt discard drops(IQM)        :           993277         334570329
    Pkt crc error drops(FDT)         :                0
```

```
    Unreachable dest cell drops      :                0
    Internal Error Count             :         41984110
    Internal Drop Count              :                0

FIA Tx (From Fabric) Statistics
```

--- Cell counters: Pkts Bytes Data cells : 500 Control cells : 179368087015 Reassembled packet counters: Pkts received from fabric : 500 Tx Ucast pkts : 500 86500 Tx Mcast pkts : 0 0 Tx pkts (EPNI) : 500 81000 Tx pkts sent to switch : 250 53000 Bcast pkts sent to switch : 0 Mcast pkts sent to switch : 0 Ucast pkts sent to switch : 250 **Tx segments sent to pse : 250 29000**

```
    Tx pkts sent to pse (NBI)        :              500              49000

Drop counters:
    Tx pkts dropped EPNI             :                0
    Tx Ucast pkts dropped            :                0
    Tx Mcast pkts dropped            :                0
    Tx pkts dropped in EGQ(RQP + EHP):                0
    Control cell Drops               :                0
    Data cell Drops                  :                0
    Tx pkts dropped switch           :                0
    Tx pkts dropped pse              :                0
    Internal Error Count             :                0
    Internal Drop Count              :                0
```

Initiate ping of 1000 packets.

RP/0/RP0/CPU0:NCS6k-Deploy#ping 10.67.1.1 count 1000 Type escape sequence to abort. Sending 1000, 100-byte ICMP Echos to 10.67.1.1, timeout is 2 seconds:

```
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Success rate is 100 percent (1000/1000), round-trip min/avg/max = 2/3/8 ms
```

Check counters again to see increment of 1000 packets.

RP/0/RP0/CPU0:NCS6k-Deploy#**sh controllers fia statistics instance 1 loc 0/0/cpu0**

```
FIA Statistics Rack: 0, Slot: 0, Asic instance: 1

FIA Rx (To Fabric) Statistics.
```

--- Input Pkt counters Pkts Bytes Rx pkts from pse : 1250 265000 Rx pkts from switch : 994927 349849612 bcast pkts from switch : 0 mcast pkts from switch : 993677 **ucast pkts from switch : 1250**

```
    Rx pkts enqueued(IQM)            :             2500             432500
    Rx pkts dequeued(IQM)            :             2500             432500
    Rx pkts sent to fabric           :             2500

Cell counters:
    Data cells sent to fabric        :             2500             432500
    Control cells sent to fabric     :     183111332632

Drop counters:
    Rx burst error drops(NBI)        :                0
    Rx error drops(Switch)           :                0
```

```
    Rx error drops(pse)              :                0
    Rx pkt discard drops(IQM)        :           993676         334707420
    Pkt crc error drops(FDT)         :                0
    Unreachable dest cell drops      :                0
    Internal Error Count             :         42004879
    Internal Drop Count              :                0

FIA Tx (From Fabric) Statistics
------------------------------------------------------------------------ Cell counters:
Pkts Bytes Data cells : 2500 Control cells : 179438200981 Reassembled packet counters: Pkts
received from fabric : 2500 Tx Ucast pkts : 2500 432500 Tx Mcast pkts : 0 0 Tx pkts (EPNI)
: 2500 405000 Tx pkts sent to switch : 1250 265000 Bcast pkts sent to switch : 0 Mcast pkts
sent to switch : 0 Ucast pkts sent to switch : 1250     Tx segments sent to pse          :
1250            145000
    Tx pkts sent to pse (NBI)        :             2500            245000

Drop counters:
    Tx pkts dropped EPNI             :                0
    Tx Ucast pkts dropped            :                0
    Tx Mcast pkts dropped            :                0
    Tx pkts dropped in EGQ(RQP + EHP):                0
    Control cell Drops               :                0
    Data cell Drops                  :                0
    Tx pkts dropped switch           :                0
    Tx pkts dropped pse              :                0
    Internal Error Count             :                0
    Internal Drop Count              :                0
```

6. **Check Packet Switching Engine (PSE) counters.Check initial counter value.**

```
RP/0/RP0/CPU0:NCS6k-Deploy#sh control pse statistics summ instance 1 loc 0/0/cpu0
STATISTICS SUMMARY:

INGRESS
-------
From L2 [LSIM]:
Packets: 1261
  Bytes:   163336
To Fabric:
  Packets: 1250
  Bytes:   265000

EGRESS
------
From Fabric:
  Packets: 1250
  Bytes:   145000
To TM:
  Packets: 1272
To L2 [LSIM]:
  Packets: 1261
  Bytes:   142962

TO/FROM CPU
-----------
To CPU:
  Packets: 11
From CPU:
  Packets: 11
```

Generate 1000 ping packets.

```
RP/0/RP0/CPU0:NCS6k-Deploy#ping  10.67.1.1 count 1000
Type escape sequence to abort.
Sending 1000, 100-byte ICMP Echos to 10.67.1.1, timeout is 2 seconds:
```

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! !!!!!!!!!!!!!!!!!!!!
Success rate is 100 percent (1000/1000), round-trip min/avg/max = 3/4/9 ms
Check counter again to see increment of 1000 packets.
RP/0/RP0/CPU0:NCS6k-Deploy#sh control pse statistics summ instance 1 loc 0/0/cpu0
STATISTICS SUMMARY:

INGRESS
-------
From L2 [LSIM]:
  Packets: 2261
  Bytes:   293336
To Fabric:
  Packets: 2250
  Bytes:   477000

EGRESS
------
From Fabric:
  Packets: 2250
  Bytes:   261000
To TM:
  Packets: 2272
To L2 [LSIM]:
  Packets: 2261
  Bytes:   256962

TO/FROM CPU
-----------
To CPU:
  Packets: 11
From CPU:
  Packets: 11
```

7. **Checking Physical Layer Interface Module (PLIM) ASIC counters.** **Check initial counter value.**

```
RP/0/RP0/CPU0:NCS6k-Deploy#sh controllers  plim  asic statistics interface  Te0/0/0/2/0
                               Node: 0/0/CPU0
-------------------------------------------------------------------------------
TenGigE0/0/0/2/0 Tx Statistics ----------------------------------------------- Total Packets
: 2256 Total Bytes : 265884 Total Good Packets : 2256 Total Good Bytes : 265884 Unicast
Packets          : 2256             Multicast Packets        : 0
Broadcast Packets        : 0                64 Byte Packets          : 6
65to127  Byte Packets    : 2250             128to255 Byte Packets    : 0
256to511 Byte Packets    : 0                512to1023 Byte Packets   : 0
1024to1518 Byte Packets  : 0                1519to1522 Byte Packets  : 0
1523to1548 Byte Packets  : 0                1549to2000 Byte Packets  : 0
2001to_MRU Byte Packets  : 0                Non Pause BPDU Packets   : 0
Classic Pause Packets    : 0
Class Based Pause Pkts 0 : 0                Class Based Pause Pkts 1 : 0
Class Based Pause Pkts 2 : 0                Class Based Pause Pkts 3 : 0
```

```
Class Based Pause Pkts 4 : 0                Class Based Pause Pkts 5 : 0
Class Based Pause Pkts 6 : 0                Class Based Pause Pkts 7 : 0

Dropped Packets
===============
Drained Packets          : 0                Abort                    : 0
Length Error             : 0                Giant                    : 0
Tail Drop: HP Queue      : 0                Tail Drop: LP Queue      : 0

TenGigE0/0/0/2/0 Rx Statistics
-----------------------------------------------
Total Packets : 2256 Total Bytes : 265884 Total Good Packets : 2256 Total Good Bytes :
265884 Unicast Packets          : 2256              Multicast Packets        : 0
Broadcast Packets        : 0                64 Byte Packets          : 6
65to127  Byte Packets    : 2250             128to255 Byte Packets    : 0
256to511 Byte Packets    : 0                512to1023 Byte Packets   : 0
1024to1518 Byte Packets  : 0                1519to1522 Byte Packets  : 0
1523to1548 Byte Packets  : 0                1549to2000 Byte Packets  : 0
2001to_MRU Byte Packets  : 0                Non Pause BPDU Packets   : 0
Classic Pause Packets    : 0
Class Based Pause Pkts 0 : 0                Class Based Pause Pkts 1 : 0
Class Based Pause Pkts 2 : 0                Class Based Pause Pkts 3 : 0
Class Based Pause Pkts 4 : 0                Class Based Pause Pkts 5 : 0
Class Based Pause Pkts 6 : 0                Class Based Pause Pkts 7 : 0

Dropped Packets
===============
Runts                    : 0                Fragments                : 0
Jumbo                    : 0                Jabber                   : 0
CRC                      : 0                Code Error               : 0
Code Violation           : 0                Bad Preamble             : 0
IPG Violation            : 0
Packet HPQ QoS Ctl Drop  : 0                Bytes HPQ QoS Ctl Drop   : 0
Packet HPQ QoS HP Drop   : 0                Bytes HPQ QoS HP Drop    : 0
Packet HPQ Ctl Tail Drop : 0                Bytes HPQ Ctl Tail Drop  : 0
Packet HPQ HP Tail Drop  : 0                Bytes HPQ HP Tail Drop   : 0
Packet LPQ LP1 Tail Drop : 0                Bytes LPQ LP1 Tail Drop  : 0
Packet LPQ LP2 Tail Drop : 0                Bytes LPQ LP2 Tail Drop  : 0
Packet TCAM Miss         : 0                Bytes TCAM Miss          : 0
Packet EOP Abort Drop    : 0                Bytes EOP Abort Drop     : 0
Packet Policy Deny       : 0                Bytes Policy Deny        : 0

Rx Packet Drop Details
======================
Unknown Dest MAC Pkts    : 0
Unknown E-Type Pkts      : 0
Unknown Encap Pkts       : 0                Unknown Encap Bytes      : 0
Unknown VLAN Pkts        : 0                Unknown VLAN Bytes       : 0
L2 Subif VLAN Deny Pkts  : 0                L2 Subif VLAN Deny Bytes : 0


Rx Accepted Packet Details
==========================
Packet HPQ CTL Sent      : 6                Bytes HPQ CTL Sent       : 384
Packet HPQ HP  Sent      : 0                Bytes HPQ HP  Sent       : 0
Packet LPQ LP1 Sent      : 0                Bytes LPQ LP1 Sent       : 0
Packet LPQ LP2 Sent      : 0                Bytes LPQ LP2 Sent       : 0
```

Initiate 1000 ping packets.

```
RP/0/RP0/CPU0:NCS6k-Deploy#ping  10.67.1.1 count 1000
Type escape sequence to abort.
Sending 1000, 100-byte ICMP Echos to 10.67.1.1, timeout is 2 seconds:
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

```
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! !!!!!!!!!!!!!!!!!!!!
Success rate is 100 percent (1000/1000), round-trip min/avg/max = 3/5/9 ms
```

Check counter again to see increment of 1000 packets.

```
RP/0/RP0/CPU0:NCS6k-Deploy#sh controllers  plim  asic statistics interface  Ten0/0/0/2/0
                               Node: 0/0/CPU0
-------------------------------------------------------------------------------
TenGigE0/0/0/2/0 Tx Statistics ----------------------------------------------- Total Packets
: 3256 Total Bytes : 383884 Total Good Packets : 3256 Total Good Bytes : 383884 Unicast
Packets          : 3256            Multicast Packets        : 0
Broadcast Packets        : 0                 64 Byte Packets          : 6
65to127  Byte Packets    : 3250              128to255 Byte Packets    : 0
256to511 Byte Packets    : 0                 512to1023 Byte Packets   : 0
1024to1518 Byte Packets  : 0                 1519to1522 Byte Packets  : 0
1523to1548 Byte Packets  : 0                 1549to2000 Byte Packets  : 0
2001to_MRU Byte Packets  : 0                 Non Pause BPDU Packets   : 0
Classic Pause Packets    : 0
Class Based Pause Pkts 0 : 0                 Class Based Pause Pkts 1 : 0
Class Based Pause Pkts 2 : 0                 Class Based Pause Pkts 3 : 0
Class Based Pause Pkts 4 : 0                 Class Based Pause Pkts 5 : 0
Class Based Pause Pkts 6 : 0                 Class Based Pause Pkts 7 : 0

Dropped Packets
===============
Drained Packets          : 0                 Abort                    : 0
Length Error             : 0                 Giant                    : 0
Tail Drop: HP Queue      : 0                 Tail Drop: LP Queue      : 0

TenGigE0/0/0/2/0 Rx Statistics
----------------------------------------------
Total Packets : 3256 Total Bytes : 383884 Total Good Packets : 3256 Total Good Bytes :
383884 Unicast Packets          : 3256              Multicast Packets        : 0
Broadcast Packets        : 0                 64 Byte Packets          : 6
65to127  Byte Packets    : 3250              128to255 Byte Packets    : 0
256to511 Byte Packets    : 0                 512to1023 Byte Packets   : 0
1024to1518 Byte Packets  : 0                 1519to1522 Byte Packets  : 0
1523to1548 Byte Packets  : 0                 1549to2000 Byte Packets  : 0
2001to_MRU Byte Packets  : 0                 Non Pause BPDU Packets   : 0
Classic Pause Packets    : 0
Class Based Pause Pkts 0 : 0                 Class Based Pause Pkts 1 : 0
Class Based Pause Pkts 2 : 0                 Class Based Pause Pkts 3 : 0
Class Based Pause Pkts 4 : 0                 Class Based Pause Pkts 5 : 0
Class Based Pause Pkts 6 : 0                 Class Based Pause Pkts 7 : 0

Dropped Packets
===============
Runts                    : 0                 Fragments                : 0
Jumbo                    : 0                 Jabber                   : 0
CRC                      : 0                 Code Error               : 0
Code Violation           : 0                 Bad Preamble             : 0
IPG Violation            : 0
Packet HPQ QoS Ctl Drop  : 0                 Bytes HPQ QoS Ctl Drop   : 0
Packet HPQ QoS HP Drop   : 0                 Bytes HPQ QoS HP Drop    : 0
```

```
Packet HPQ Ctl Tail Drop : 0                Bytes HPQ Ctl Tail Drop  : 0
Packet HPQ HP Tail Drop  : 0                Bytes HPQ HP Tail Drop   : 0
Packet LPQ LP1 Tail Drop : 0                Bytes LPQ LP1 Tail Drop  : 0
Packet LPQ LP2 Tail Drop : 0                Bytes LPQ LP2 Tail Drop  : 0
Packet TCAM Miss         : 0                Bytes TCAM Miss          : 0
Packet EOP Abort Drop    : 0                Bytes EOP Abort Drop     : 0
Packet Policy Deny       : 0                Bytes Policy Deny        : 0

Rx Packet Drop Details
======================
Unknown Dest MAC Pkts    : 0
Unknown E-Type Pkts      : 0
Unknown Encap Pkts       : 0                Unknown Encap Bytes      : 0
Unknown VLAN Pkts        : 0                Unknown VLAN Bytes       : 0
L2 Subif VLAN Deny Pkts  : 0                L2 Subif VLAN Deny Bytes : 0


Rx Accepted Packet Details
==========================
Packet HPQ CTL Sent      : 6                Bytes HPQ CTL Sent       : 384
Packet HPQ HP  Sent      : 0                Bytes HPQ HP  Sent       : 0
Packet LPQ LP1 Sent      : 0                Bytes LPQ LP1 Sent       : 0
Packet LPQ LP2 Sent      : 0                Bytes LPQ LP2 Sent       : 0
```

8. **Check "show interface" counters.**It is good idea to check this in first step but in sequence of packet flow this would be last. It helps to identify if the packet has been sent to the line, and if the packet has been returned from the line. It can help narrow down whether the problem is inside the box or outside of this box.**Check initial counter values.**

```
RP/0/RP0/CPU0:NCS6k-Deploy#show inter ten 0/0/0/2/0
TenGigE0/0/0/2/0 is up, line protocol is up
  Interface state transitions: 1
  Hardware is TenGigE, address is e051.2a0f.8c29 (bia e051.2a0f.8c29)
  Description: Connected to 0/7/0/1 - CRS-F
  Internet address is 10.67.1.2/30
  MTU 1514 bytes, BW 10000000 Kbit (Max: 10000000 Kbit)
     reliability 0/255, txload 0/255, rxload 0/255
  Encapsulation ARPA,
  Full-duplex, 10000Mb/s, SR, link type is force-up
  output flow control is off, input flow control is off
  loopback not set,
  ARP type ARPA, ARP timeout 04:00:00
  Last input 00:14:22, output 00:14:22
  Last clearing of "show interface" counters 22:08:42
  30 second input rate 0 bits/sec, 0 packets/sec
  30 second output rate 0 bits/sec, 0 packets/sec
     3256 packets input, 370860 bytes, 0 total input drops
     0 drops for unrecognized upper-level protocol
     Received 0 broadcast packets, 0 multicast packets
              0 runts, 0 giants, 0 throttles, 0 parity
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     3256 packets output, 370860 bytes, 0 total output drops
     Output 0 broadcast packets, 0 multicast packets
     0 output errors, 0 underruns, 0 applique, 0 resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

Initiate 1000 ping packets.

```
RP/0/RP0/CPU0:NCS6k-Deploy#ping  10.67.1.1 cou 1000
Type escape sequence to abort.
Sending 1000, 100-byte ICMP Echos to 10.67.1.1, timeout is 2 seconds:
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
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!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! !!!!!!!!!!!!!!!!!!!!
Success rate is 100 percent (1000/1000), round-trip min/avg/max = 3/4/8 ms
```

Check counter again to see increment of 1000 packets.

```
RP/0/RP0/CPU0:NCS6k-Deploy#show inter ten 0/0/0/2/0
TenGigE0/0/0/2/0 is up, line protocol is up
  Interface state transitions: 1
  Hardware is TenGigE, address is e051.2a0f.8c29 (bia e051.2a0f.8c29)
  Description: Connected to 0/7/0/1 - CRS-F
  Internet address is 10.67.1.2/30
  MTU 1514 bytes, BW 10000000 Kbit (Max: 10000000 Kbit)
     reliability 255/255, txload 0/255, rxload 0/255
  Encapsulation ARPA,
  Full-duplex, 10000Mb/s, SR, link type is force-up
  output flow control is off, input flow control is off
  loopback not set,
  ARP type ARPA, ARP timeout 04:00:00
  Last input 00:00:00, output 00:00:00
  Last clearing of "show interface" counters 22:09:38
  30 second input rate 1000 bits/sec, 2 packets/sec
  30 second output rate 1000 bits/sec, 2 packets/sec
     4256 packets input, 484860 bytes, 0 total input drops
     0 drops for unrecognized upper-level protocol
     Received 0 broadcast packets, 0 multicast packets
              0 runts, 0 giants, 0 throttles, 0 parity
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     4256 packets output, 484860 bytes, 0 total output drops
     Output 0 broadcast packets, 0 multicast packets
     0 output errors, 0 underruns, 0 applique, 0 resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```