Scaling Issue Response

First experiment was sending bigFlows.pcap to manager with no NFs running

```
\ Ports 0-1 of 2    <Main Page>  Copyright (c) <2010-2019>, Intel Corporation
   Flags:Port        : P------PCAP        :0 P------Single       :1
Link State           :           <UP-10000-FD>        <UP-10000-FD>      ---Total Rate---
Pkts/s Max/Rx        :                    0/0                  1/0                   1/0
     Max/Tx          :        2544792/2543804                  0/0       2544792/2543804
MBits/s Rx/Tx        :                 0/9617                  0/0                0/9617
Broadcast            :                      0                    0
Multicast            :                      0                    0
Sizes 64             :                      0                    0
     65-127          :                      0                   10
     128-255         :                      0                    1
     256-511         :                      0                    0
     512-1023        :                      0                    0
     1024-1518       :                      0                    0
Runts/Jumbos         :                    0/0                  0/0
ARP/ICMP Pkts        :                    0/0                  0/0
Errors Rx/Tx         :                    0/0                  0/0
Total Rx Pkts        :                      0                   11
     Tx Pkts         :               33787009                    0
     Rx MBs          :                      0                    0
     Tx MBs          :                 127714                    0
                     :
Pattern Type         :                 abcd...              abcd...
Tx Count/% Rate      :           Forever /100%        Forever /100%
Pkt Size/Tx Burst    :               64 /   64            64 /   64
TTL/Port Src/Dest    :           4/ 1234/ 5678        4/ 1234/ 5678
Pkt Type:VLAN ID     :           IPv4 / TCP:0001      IPv4 / TCP:0001
802.1p CoS/DSCP/IPP  :               0/  0/  0            0/  0/  0
VxLAN Flg/Grp/vid    :        0000/   0/    0       0000/   0/    0
IP  Destination      :            192.168.1.1          192.168.0.1
    Source           :         192.168.0.1/24       192.168.1.1/24
MAC Destination      :      90:e2:ba:2f:f2:e9    90:e2:ba:2f:f2:e8
    Source           :      90:e2:ba:2f:f2:e8    90:e2:ba:2f:f2:e9
PCI Vendor/Addr      :      8086:10fb/07:00.0    8086:10fb/07:00.1

-- Pktgen 20.03.0 (DPDK 20.05.0)  Powered by DPDK  (pid:3341) ----------------
```

Pktgen running at 9.6 Gbps with bigFlows.pcap and no NFs running

```
PORTS
-----
Port 0: '90:e2:ba:5b:eb:74'    Port 1: '90:e2:ba:5b:eb:75'

Port 0 - rx:         0 (        0 pps) tx:         0 (        0 pps)
Port 1 - rx:  55144064 (        0 pps) tx:         0 (        0 pps)

NF TAG          IID / SID / CORE    rx_pps  /  tx_pps        rx_drop  /  tx_drop         out  /   tonf   /   drop
-------------------------------------------------------------------------------------------------------------------
█
```

Manager running with no NFs

```
\ Ports 0-1 of 2    <Main Page>  Copyright (c) <2010-2019>, Intel Corporation
   Flags:Port        : P------PCAP          :0 P------Single      :1
Link State           :        <UP-10000-FD>            <UP-10000-FD>      ---Total Rate---
Pkts/s Max/Rx        :                 0/0                      4/1                    4/1
       Max/Tx        :           2544792/0                      0/0              2544792/0
MBits/s Rx/Tx        :                 0/0                      0/0                    0/0
Broadcast            :                   0                        0
Multicast            :                   0                        1
Sizes 64             :                   0                        0
      65-127         :                   0                      124
      128-255        :                   0                        8
      256-511        :                   0                        1
      512-1023       :                   0                        0
      1024-1518      :                   0                        0
Runts/Jumbos         :                 0/0                      0/0
ARP/ICMP Pkts        :                 0/0                      0/0
Errors Rx/Tx         :                 0/0                      0/0
Total Rx Pkts        :                   0                      133
       Tx Pkts       :            55144064                        0
       Rx MBs        :                   0                        0
       Tx MBs        :              208434                        0
                     :
Pattern Type         :              abcd...                  abcd...
Tx Count/% Rate      :         Forever /100%            Forever /100%
Pkt Size/Tx Burst    :            64 /   64                64 /   64
TTL/Port Src/Dest    :         4/ 1234/ 5678            4/ 1234/ 5678
Pkt Type:VLAN ID     :         IPv4 / TCP:0001          IPv4 / TCP:0001
802.1p CoS/DSCP/IPP  :            0/  0/  0                 0/  0/  0
VxLAN Flg/Grp/vid    :         0000/   0/   0           0000/   0/   0
IP  Destination      :           192.168.1.1              192.168.0.1
    Source           :         192.168.0.1/24           192.168.1.1/24
MAC Destination      :       90:e2:ba:2f:f2:e9        90:e2:ba:2f:f2:e8
    Source           :       90:e2:ba:2f:f2:e8        90:e2:ba:2f:f2:e9
PCI Vendor/Addr      :       8086:10fb/07:00.0        8086:10fb/07:00.1

-- Pktgen 20.03.0 (DPDK 20.05.0)  Powered by DPDK  (pid:3341) -----------------
```

Pktgen after execution with all packets being received by manager

Conclusion: Pktgen ran at 9.6 Gbps and the manager received 100% of the packets sent from bigFlows.pcap

Sending bigFlows.pcap to the manager with 5 NFs running

```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL    PORTS

| Ports 0-1 of 2    <Main Page>  Copyright (c) <2010-2019>, Intel Corporation
  Flags:Port        : P------PCAP       :0 P------Single      :1
Link State          :       <UP-10000-FD>         <UP-10000-FD>      ---Total Rate---
Pkts/s Max/Rx       :                 0/0                   2/1                   2/1
      Max/Tx        : 2551742/2551742                       0/0       2551742/2551742
MBits/s Rx/Tx       :              0/9653                   0/0                0/9653
Broadcast           :                   0                     0
Multicast           :                   0                     0
Sizes 64            :                   0                     0
      65-127        :                   0                    27
      128-255       :                   0                     2
      256-511       :                   0                     0
      512-1023      :                   0                     0
      1024-1518     :                   0                     0
Runts/Jumbos        :                 0/0                   0/0
ARP/ICMP Pkts       :                 0/0                   0/0
Errors Rx/Tx        :                 0/0                   0/0
Total Rx Pkts       :                   0                    29
      Tx Pkts       :            47423953                     0
      Rx MBs        :                   0                     0
      Tx MBs        :              179269                     0
                    :
Pattern Type        :              abcd...               abcd...
Tx Count/% Rate     :        Forever /100%         Forever /100%
Pkt Size/Tx Burst   :            64 /   64             64 /   64
TTL/Port Src/Dest   :        4/ 1234/ 5678         4/ 1234/ 5678
Pkt Type:VLAN ID    :        IPv4 / TCP:0001       IPv4 / TCP:0001
802.1p CoS/DSCP/IPP :          0/  0/  0             0/  0/  0
VxLAN Flg/Grp/vid   :      0000/   0/   0         0000/   0/   0
IP  Destination     :           192.168.1.1           192.168.0.1
    Source          :        192.168.0.1/24        192.168.1.1/24
MAC Destination     :     90:e2:ba:2f:f2:e9     90:e2:ba:2f:f2:e8
    Source          :     90:e2:ba:2f:f2:e8     90:e2:ba:2f:f2:e9
PCI Vendor/Addr     :     8086:10fb/07:00.0     8086:10fb/07:00.1

-- Pktgen 20.03.0 (DPDK 20.05.0)  Powered by DPDK  (pid:3549) -----------------
```

Pktgen running bigFlows.pcap at 9.6 Gbps with 5 NFs running

```
PORTS
-----
Port 0: '90:e2:ba:5b:eb:74'    Port 1: '90:e2:ba:5b:eb:75'

Port 0 - rx:        0 (       0 pps) tx:       0 (       0 pps)
Port 1 - rx: 186119040 (       0 pps) tx:       0 (       0 pps)

NF TAG        IID / SID / CORE  rx_pps / tx_pps    rx_drop / tx_drop       out  /   tonf   /  drop
-----------------------------------------------------------------------------------------------------
scaling       1 / 1 / 3           0 / 0             0 / 32024874           0 / 32024874   / 0
scaling       2 / 1 / 4           0 / 0             0 / 38369985           0 / 38369985   / 0
scaling       3 / 1 / 5           0 / 0             0 / 43152386           0 / 43152386   / 0
scaling       4 / 1 / 6           0 / 0             0 / 32032274           0 / 32032274   / 0
scaling       5 / 1 / 7           0 / 0             0 / 40540161           0 / 40540161   / 0

Service id totals
-----------------
SID 1   5NFs -                    0 / 0             0 / 186119680          0 / 186119680  / 0
[]
```

Manager running with 5 NFs

$186,119,680 - 186,119,040 = 640 = 128 * 5$ (each scaling NF starts
with a tx drop of 128)

```
\ Ports 0-1 of 2    <Main Page>  Copyright (c) <2010-2019>, Intel Corporation
    Flags:Port        : P------PCAP          :0 P------Single        :1
  Link State          :          <UP-10000-FD>          <UP-10000-FD>       ---Total Rate---
  Pkts/s Max/Rx       :                    0/0                    20/1                    20/1
        Max/Tx        :              2551742/0                    0/0               2551742/0
  MBits/s Rx/Tx       :                    0/0                    0/0                     0/0
  Broadcast           :                      0                      0
  Multicast           :                      0                     38
  Sizes 64            :                      0                      0
       65-127         :                      0                    259
       128-255        :                      0                     56
       256-511        :                      0                     38
       512-1023       :                      0                      0
       1024-1518      :                      0                      0
  Runts/Jumbos        :                    0/0                    0/0
  ARP/ICMP Pkts       :                    0/0                    0/0
  Errors Rx/Tx        :                    0/0                    0/0
  Total Rx Pkts       :                      0                    353
        Tx Pkts       :              186119040                      0
        Rx MBs        :                      0                      0
        Tx MBs        :                 703607                      0
                      :
  Pattern Type        :                 abcd...                 abcd...
  Tx Count/% Rate     :           Forever /100%           Forever /100%
  Pkt Size/Tx Burst   :              64 /    64              64 /    64
  TTL/Port Src/Dest   :            4/ 1234/ 5678            4/ 1234/ 5678
  Pkt Type:VLAN ID    :          IPv4 / TCP:0001          IPv4 / TCP:0001
  802.1p CoS/DSCP/IPP :              0/  0/  0              0/  0/  0
  VxLAN Flg/Grp/vid   :          0000/    0/    0          0000/    0/    0
  IP  Destination     :            192.168.1.1            192.168.0.1
      Source          :         192.168.0.1/24         192.168.1.1/24
  MAC Destination     :      90:e2:ba:2f:f2:e9      90:e2:ba:2f:f2:e8
      Source          :      90:e2:ba:2f:f2:e8      90:e2:ba:2f:f2:e9
  PCI Vendor/Addr     :      8086:10fb/07:00.0      8086:10fb/07:00.1

 -- Pktgen 20.03.0 (DPDK 20.05.0)  Powered by DPDK  (pid:3549) ----------------
```

Pktgen after execution with all packets being received by manager

Conclusion: Pktgen ran at 9.6 Gbps and the manager received 100% of the packets sent from bigFlows.pcap with 5 NFs running

Regardless of the pcap file, or the number of NFs running (I ran with none, 2, 4, and 5), we were able to achieve a minimum of 9.6 Gbps while 100% of the packets sent were received.