



# Accelerating Network Performance

## QUALCOMM CENTRIQ ARM-BASED SERVERS AND NETRONOME AGILIO CX SMARTNICS

DISCOVER HOW  
QUALCOMM AND  
NETRONOME  
DELIVER LEADING  
NFV PERFORMANCE

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### INTRODUCTION

As workloads shift toward the cloud and as more networking functions are being performed on servers, service providers are looking for solutions that will improve network throughput while enabling more services and customers on every server in their data center.

Qualcomm and Netronome partnered to provide a solution that improves server performance and recently demonstrated it at the Qualcomm Centriq processor launch event on November 8, 2017.

For this demo, there were two use cases compared. The first use case utilizes an industry standard x86 server running OVS-DPDK for server-based networking. The second use case is a server with the recently released ARM-based Qualcomm Centriq 2400 processor and a Netronome Agilio SmartNIC to offload and accelerate server-based networking. In both cases an equivalent Virtual Network Functions (VNFs) is run to simulate I/O intensive workloads.

### X86 OVS-DPDK SOLUTION



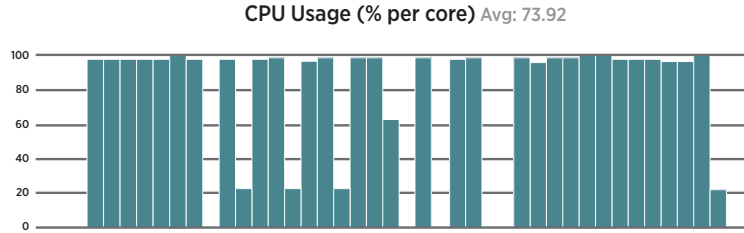
The x86 server was populated with three of those VNFs and each was assigned 6 cores (12 threads) per VNF. OVS-DPDK v2.6 used four cores (8 threads) for network processing.



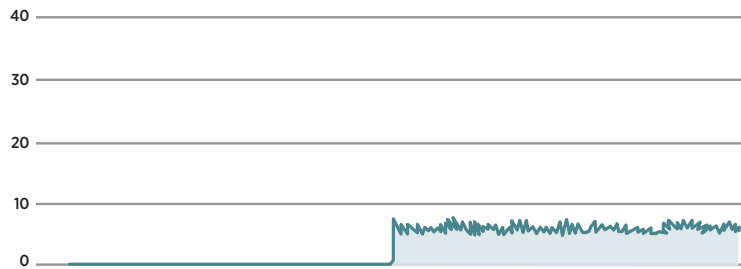
**VNF EXAMPLE**

*SNORT IS A SIGNATURE-BASED INTRUSION DETECTION SYSTEM (IDS) THAT PERFORMS REAL-TIME TRAFFIC ANALYSIS AND PACKET LOGGING ON IP NETWORKS. SNORT CAN DO PROTOCOL ANALYSIS, CONTENT SEARCHING/MATCHING AND DETECT A VARIETY OF ATTACKS AND PROBES, SUCH AS BUFFER OVERFLOWS, STEALTH PORT SCANS, CGI ATTACKS, SMB PROBES AND OS FINGERPRINTING ATTEMPTS. TO ENABLE 72 DEFAULT SETS OF RULES (14,242 DETECTION RULES), BEING NETWORK THROUGHPUT INTENSIVE, SNORT UTILIZES 0.8% OF CPU RESOURCES. SCALING TO 7MPPS NETWORK THROUGHPUT CAN TAKE UP TO 12 CORES.*

The x86 ecosystem falls behind when it comes to density, scalability and performance of the VNF. Our performance metrics indicate that I/O intensive VNFs (for example: passive IDS, lawful interception, SIEM, DDoS analyzers) deployed on an x86 OVS-DPDK server expose the limitations of the solution.



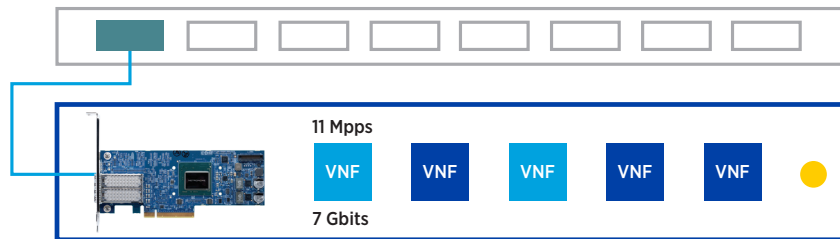
Total CPU utilization averaged 70% while server throughput performance maxed at 6.12 Gb/s. From that point on, there was no more CPU headroom to add another VNF in the virtually switched, VXLAN tunneled environment. Throughput bottlenecked at approximately five million packets per second (64 Bytes packet size and 1024 flows).



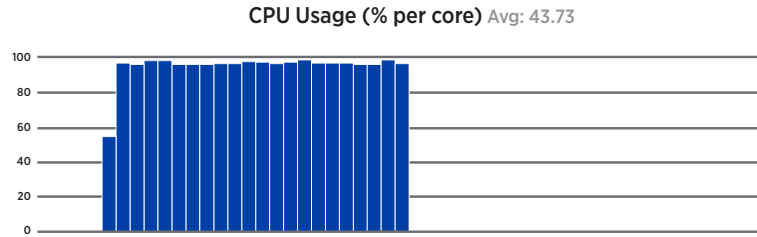
**Throughput 6.12 Gb/s**

**OVS-DPDK SOFTWARE-BASED SOLUTION DOES NOT DELIVER ENOUGH PERFORMANCE FOR MODERN VNF INFRASTRUCTURES**

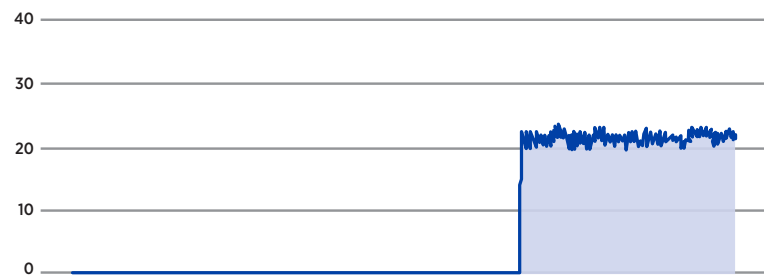
**QUALCOMM CENTRIQ 2400 WITH NETRONOME AGILIO SMARTNIC SOLUTION**



For this test, six cores per VNF were allocated. The major difference here is that hardware acceleration of the data plane is enabled because the Netronome SmartNIC is present. There is little to no overhead on the CPU when networking is offloaded and accelerated by the Agilio SmartNIC. Similar to the x86 test, all VNFs performed packet forwarding based on MAC address. Maximum VXLAN tunneled traffic I/O throughput was measured as a function of small packet size (64 Bytes / 1024 flows).



The 10nm ARM-based Qualcomm Centriq 2400 paired with Netronome Agilio CX SmartNICs provided hardware accelerated performance that gave the test server the ability to deliver almost 2X more VNFs. It also allowed the Qualcomm CPU 50% more headroom for compute intensive workloads.



**Throughput 21.45 Gb/s**

Total server throughput performance maxed at 21.45 Gb/s. This is 4X more throughput with better latency performance compared to the x86 server with OVS-DPDK. The packet per second performance was a staggering 32 Mpps for the Qualcomm Centriq with Agilio SmartNIC versus 9 Mpps on the x86 platform.

**CONCLUSION**

The Qualcomm and Netronome-based solution provides the ability to efficiently manage I/O and compute workloads in the data center. The joint solution delivers the following:

- Industry-leading application density
- Efficient data center architecture
- Open and future-proof technology

Watch the live demo at: <https://www.youtube.com/watch?v=ghzjfHo1eKO>



**Netronome Systems, Inc.**  
 2903 Bunker Hill Lane, Suite 150 Santa Clara, CA 95054  
 Tel: 408.496.0022 | Fax: 408.586.0002  
[www.netronome.com](http://www.netronome.com)

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## APPENDIX

List of hardware and software used during the test.

### Supermicro X10DRL-LN4 Server (x86\_64)

Dual socket

Manufacturer: Supermicro

Product Name: Super Server

40x CPU - Intel(R) Xeon(R) CPU E5-2630 v4 @ 2.20GHz (2 sockets; 10 cores per socket; 2 threads per core)

64 GB RAM

Type: DDR4;

Configured Clock Speed: 2133 MHz

### Qualcomm Centriq Server (aarch64)

Single socket

48x CPU - 2.5 GHz ARM Falkor Cores

Version: 1.1

94 GB RAM

Type: DDR4

Configured Clock Speed: 1333 MHz

### Network Interface Cards (NICs) installed in each server:

Supermicro x86 Server: Intel XL710-QDA2 (Fortville) 2x40GbE

Qualcomm Centriq Server: Agilio CX 2x40GbE SmartNIC

### Software on Supermicro Server

OS: Ubuntu 16.04.3 LTS

Kernel: 4.4.0-87-generic x86\_64 GNU/Linux

DPDK-OVS 2.6.1

### Software on Qualcomm Server:

OS: Ubuntu 16.04.1 LTS

Kernel: 4.7.0-2-generic aarch64 GNU/Linux

Agilio OVS 2.6B