

## Cavium LiquidIO® II Smart NIC Family

# LiquidIO® II 10/25G Smart NIC Family

## Industry's Leading Smart NICs with Intelligent Network and Security Acceleration

### Product Brief

#### Highlights

- Flexible I/O for cloud compute—10/25GbE with broad interoperability
- Full open virtual switch (OVS) offload—Accelerate the most demanding cloud network function virtualization (NFV) workloads
- Security acceleration and offloads—Comprehensive data center security solutions with acceleration and offloads
- Maximize virtual machine (VM) density and best-in-class performance for multi-domain/multi-tenant public or private clouds
- Full programmability for faster time-to-market with custom features
- Huge TCO benefits—Reduces power, management, and infrastructure costs.

#### OVERVIEW

Cavium's LiquidIO® II Smart NIC adapters with 10/25 Gigabit Ethernet (GbE) connectivity, built using Cavium's market leading technology, provide the best-in-class performance for hyper-scale, Telco, and enterprise/private data centers with intelligent network, storage, and security acceleration. Cloud infrastructure requires optimizing equipment for performance, cost, and power at scale. Intelligent adapters can achieve these goals by moving specific workloads onto highly optimized adapter hardware, leaving the host server to run more efficiently. Moving network virtualization, storage protocols, security, software defined networks (SDN), and network overlay to the adapter can dramatically reduce operating and capital expenses. LiquidIO II Smart NICs provide flexible IO capabilities, advanced network and security hardware accelerators, and software support to provide the best-in-class performance for various cloud data center models, including hyper-scale, Telco, enterprise and hybrid clouds. The constantly growing demand for security and privacy in the data centers, private and public clouds, require the use of security protocols. LiquidIO II Smart NICs use Cavium's industry leading security architecture to deliver security acceleration with IP security (IPsec) offload and inline processing, freeing up the host CPUs and easing network bottlenecks.

#### FULL OVS OFFLOAD

Virtualization has led to more efficient CPU usage for cloud infrastructures with a myriad of applications running on multiple VMs per compute node. The host-based OVS typically manages the packet switching between the VMs, and this comes at the expense of reduced scalability and higher CPU usage, as dedicated CPU cores manage packet inflow/outflow. LiquidIO solves this problem by offloading the OVS control plane and data plane from the host to the NIC, reducing CPU overhead and allowing more VMs on a compute node. This is done efficiently with multiple instances on a single node, each with their own isolated network domain over a shared network infrastructure, enabling network virtualization with performance and compute scalability.

#### LIQUIDIO INTEGRATED WITH OPENSTACK

LiquidIO II Smart NICs support the OpenStack open source infrastructure for constructing and supervising datacenter and cloud computing platforms. OVS with overlay acceleration can be easily managed through standard APIs with natively integrated OpenStack Neutron. LiquidIO II adapters provide both networking and computing services with high performance and low CPU usage. LiquidIO allows providers to rapidly and horizontally scale VMs over their entire, diverse, and widely spread network architecture to meet the needs of their customers.

#### ACCELERATE CLOUD NETWORK FUNCTION VIRTUALIZATION (NFV) WORKLOADS

In addition to OpenStack, LiquidIO II Smart NICs support NFV, which allows decoupling of network functions and services from dedicated hardware (such as routers, firewalls, and load balancers) into hosted VMs or LiquidIO II Adapters. NFV enables network administrators to flexibly create network functions and services as they need them, reducing capital and operating expenses, and enhancing business and network services agility.

#### SECURITY OFFLOADS

LiquidIO uses Cavium's industry-leading security architecture to deliver security acceleration with IPsec offload and inline processing with no CPU overhead, both as a standalone solution and as part of OVS offload (tunnel and transport mode). LiquidIO II Smart NICs support advanced features, such as packet classification and flow aggregation with encapsulation, while maintaining support for traditional offloads (inner and outer transport and checksum offload) in a virtual data center with end-to-end packet encryption. The ability to customize and handle multiple offloads with high performance separates LiquidIO from the competition.

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#### OVERLAY NETWORK OFFLOAD

In a multi-tenant cloud data center, VM isolation in a shared network infrastructure is critical. As more VMs get hosted on powerful compute nodes, efficiently managing traffic from each VM is done using overlay networks. Overlay networks carry traffic from each VM encapsulated in formats such as VXLAN, NVGRE, and GENEVE. With LiquidIO II hardware capabilities, overlay network traffic encapsulation/de-encapsulation is offloaded to the NIC, while maintaining all the traditional offloads.

#### QUALITY OF SERVICE (QOS)

Data center efficiency and scalability depends on the network adapter's ability to manage, schedule, steer, and prioritize traffic based on queue management, packet marking, congestion notification, and priority based scheduling. LiquidIO supports various mechanisms to manage and shape traffic with dedicated independent queues in hardware. LiquidIO II Smart NICs support hierarchical levels with single- or dual-rate, tri-color marking and per-queue shaping and scheduling.

#### Host Bus Interface Specifications

##### Bus Interface

- PCIe® Gen3 x8, Gen2 x8 (electrical)

##### Host Interrupts

- MSI/MSI-X

##### I/O Virtualization

- SR-IOV
- 2 physical functions (PFs)
- 126 virtual functions (VFs)

#### Ethernet Specifications

##### Ethernet Frame

- Jumbo Frame Support

##### Stateless Offloads\*

- TCP segmentation offload (TSO)
- Large send offload (LSO)
- Receive side scaling (RSS)
- Large receive offload (LRO)

##### Overlay Network Offloads\*

- Virtual Extensible LAN (VXLAN)
- Network Virtualization using Generic Routing Encapsulation (NVGRE)

#### DEEP PACKET INSPECTION ACCELERATORS

The deep packet inspection (DPI) hardware engine includes DPI hyper finite automata (HFA) engines for generic packet analysis and a dedicated DPI hyper non-deterministic finite automata (HNA) block to accelerate complex regular expression rules. Data centers can enhance cyber security with a rich set of supported crypto acceleration.

#### DPI WITH L3-L7 APPLICATION RECOGNITION

Cloud networks must support the increasing demand for data and availability with the right cybersecurity analysis tools and software. LiquidIO II hardware acceleration supports dedicated security and crypto engines to allow data analysis of traffic from L3-L7 with DPI, packet filtering and application recognition features to enhance security in datacenters.

#### FULL CUSTOM PROGRAMMABILITY

LiquidIO II Smart NICs are fully programmable in C, supported by Cavium's industry-proven software development kit (SDK). Easy programming makes LiquidIO II adapters one of the industry's most flexible, scalable, high performance, and low cost solutions.

- Generic Network Virtualization Encapsulation (GENEVE)

##### Security Offloads\*

- IP security (IPsec)

\* Any offload functionality may be customized and fully programmable by the customer.

##### On-board Memory

4/8GB DDR4 +ECC

##### Compliance

IEEE Specifications

- IEEE Std 802.3ae 10 Gigabit Ethernet
  - IEEE 802.3ad Link Aggregation and failover
  - IEEE 802.1Q.1p VLAN tags and priority
  - IEEE 802.1Qbb (PFC)
  - IEEE 802.1Qaz (ETS and DCBX)
  - IEEE 1588
- 25GbE Consortium

##### Operating Systems/Distributions\*

- CentOS, Ubuntu®
- FreeBSD

• Windows Server 2012R2

\*Please ask your Cavium representative about the latest supported O/S and Hypervisors.

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### Boot Support

- Preboot execution environment (PXE)
- Unified extensible firmware interface (UEFI)

### Physical Specifications

#### Ports

- SFP+(10GbE) / SFP28 (25GbE)
- Dual SATA ports (Gen3)

#### Dimensions

- 167.65mm x 11.80mm (210SVPN-G)
- 184.16mm x 56.15mm (225SVPN-G)

### Agency Approvals—Safety

US and Canada

- cTUVus UL

### Agency Approvals—EMI and EMC (Class A)

US and Canada

- FCC Rules, CFR Title 47, Part 15, Subpart Class A
- Industry Canada, ICES-003: Class A

### Ordering Information

#### CN2350-210SVPN-G

- Dual Port SFP+ 10GbE
- 12 Cores @ 1200MHz
- 167.65mm x 11.80mm

#### CN2360-210SVPN-G

- Dual Port SFP+ 10GbE
- 16 Cores @ 1500MHz
- 167.65mm x 11.80mm

#### CN2350-225SVPN-G

- Dual Port SFP28 25GbE
- 12 Cores @ 1200MHz
- 184.16mm x 56.15mm

#### CN2360-225SVPN-G

- Dual Port SFP28 25GbE
- 16 Cores @ 1500MHz
- 184.16mm x 56.15mm