

ALVEO™ SN1000 SmartNICs

OVERVIEW

The explosive growth of big data and increasing complexity in the modern data center demands hardware accelerators to offload a broad range of critical data center applications from CPUs. Cloud providers and enterprises must continually optimize for complex applications, adapt acceleration and resources across multiple workloads and deliver a broader range of offloads. These challenges require scalable, low-latency hardware acceleration while retaining rapid reconfigurability for changing and emerging workloads.

The Alveo™ SN1000 family of composable SmartNICs meets these challenges with software-defined hardware acceleration. Revolutionary Xilinx composability empowers providers and enterprises to effortlessly support new protocols, build custom offloads, and deploy efficient and fluid application-specific data paths using P4 or high-level synthesis (HLS).

SN1000 SmartNICs deliver protocol-level programmability at line-rate performance, and are powered by a Xilinx 16nm UltraScale+™ architecture FPGA and an A72 Arm® processor subsystem with support for up to 16 cores.

Starting with the SN1022 100Gb/s composable SmartNIC, the Alveo™ SN1000 family provides a comprehensive suite of solutions for network, storage, and compute acceleration functions on a single platform.

- > High Performance NIC - 100Gb connectivity with industry-leading small packet performance and low-latency on PCIe Gen 4.
- > Software Defined Infrastructure - Open Virtual Switch (OVS) and Virtio offloads with efficient switching and routing along with a powerful Arm A72 processor for bare metal services and control plane offloads.
- > NFV Workload Acceleration – Decoupling of network functions and services from dedicated hardware for efficient and high performance acceleration.
- > Security - Root-of-Trust secure boot and technology to ensure the integrity of the firmware and hardware.
- > QoS – Support for traffic shaping and management mechanisms with dedicated independent queues in hardware.
- > Programmability - P4 and HLS programming allowing the data plane to be fully software-defined for cloud-scale deployments.



XILINX ADVANTAGE

- > Fully composable and programmable
 - Versatile solution for containerized, virtualized, bare metal deployments
 - Comprehensive suite of security offloads including IPsec, kTLS, and SSL/TLS
 - Storage acceleration for NVMe/ TCP, Ceph and services including compression and crypto
- > Deploy hardware-accelerated custom plugins programmed in P4, HLS, or RTL
 - Adapt to changing requirements without replacing hardware
- > Hardware Root-of-Trust

Performance	SN1022
Full Duplex Throughput	200Gbps
Packet Rate	100Mpps
TCP Throughput	100Gbps
Latency (1/2 RTT)	<3us
OVS Performance ¹	100Gbps
Flow Table Entries	4M Stateful Connections
IPsec Encryption Throughput	100Gbps
Power	75W

FEATURES

Hardware

- > PCIe Gen 4 x8 or Gen 3 x16
- > 100G QSFP28 DA copper or optical transceiver
- > XCU26 FPGA based on Xilinx 16nm UltraScale+ architecture
- > On-board CPU: 16 64-bit Arm Cortex®-A72 cores at 2.0 GHz with 8 MB cache
- > 1x 4GB x 72 DDR4-2666 (Processor)
- > 2x 4GB x 72 DDR4-2666 (FPGA)

General Networking

- > TCP/UDP Checksum Offload (CSO), TCP Segmentation Offload (TSO), Generic Send Offload (GSO)
- > Generic Receive Offload (GRO), Receive Side Scaling (RSS)
- > VLAN Insertion/Removal
- > VLAN Q-in-Q Insertion/Stripping
- > Jumbo Frames (up to 9KB)

Traffic Steering

- > TCP/UDP/IP, MAC, VLAN, RSS filtering Accelerated Receive Flow Steering (ARFS), Transmit Packet Steering (XPS)

Virtualization

- > Linux Multi-queue
- > Single Root I/O Virtualization (SR-IOV)
- > Tunneling offloads; adaptable to custom overlays.

Software and FPGA Extensibility

- > Support for custom plug-ins to enable new functionality; programmed via P4, HLS, or RTL.

Manageability and Remote Boot

- > UEFI
- > Secure Firmware Upgrade and Hardware Root of Trust
- > NC-SI, PLDM Monitoring and Control, PLDM Firmware Update and MCTP support
- > MCTP transports support SMBus and PCIe VDM

OS Support

- > Red Hat RHEL, CentOS, Ubuntu, SLES, Debian for Host CPU
- > Debian-derived Linux distro for on-board Arm CPU

Network Acceleration

- > Onload®/ TCPDirect - TCP/UDP
- > Open Virtual Switch (OVS)
- > DPDK Poll Mode Driver

- > Hardware Offloaded Virtio-net
 - Virtio v0.9.5 and later
 - CSO, TSO
 - Multi-queue
 - vDPA (Virtual Data Path Acceleration)

Hardware-based Packet Processing

- > Wildcard match-action flow tables
- > Tunnel encap/decap – VXLAN, NVGRE
- > Connection Tracking
- > Packet Replication
- > Header rewrite/NAT
- > Per-rule packet and byte counters
- > MAC Address rewriting
- > 4 M stateful connections and up to 20K MegafloWS with wildcard match support

Storage Acceleration

- > Ceph RBD Client Offload
- > Hardware Offloaded Virtio-net
 - Virtio v0.9.5 and later
 - Multi-queue

Environmental Requirements²

- > Temperature:
 - Operating: ≤ 30°C (86°F)
 - Storage: –40°C to 75°C (–40°F to 167°F)
- > Humidity:
 - Operating: 8% to 90%, and a dew point of –12°C
 - Storage: 5% to 95%

Physical Dimensions (without bracket)

- > Full Height Half Length PCIe CEM
- > L: 6.59 inch (167.5 mm)
- > W: 4.38 inch (111.15 mm)
- > H: 0.72 inch (18.3 mm)

Ordering Information

- > A-SN1022-P4N-PQ: Encryption Disabled
- > A-SN1022-P4E-PQ Encryption Enabled

TAKE THE NEXT STEP

Learn more about the [Xilinx Alveo SN1000 SmartNICs](#)

Notes:

Feature availability is software release dependent. Please check release notes or contact [Xilinx Support](#) for more information.

1. Performance is driver dependent. Please check release notes or contact Xilinx Support for more information.
2. Environmental specs are preliminary.

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