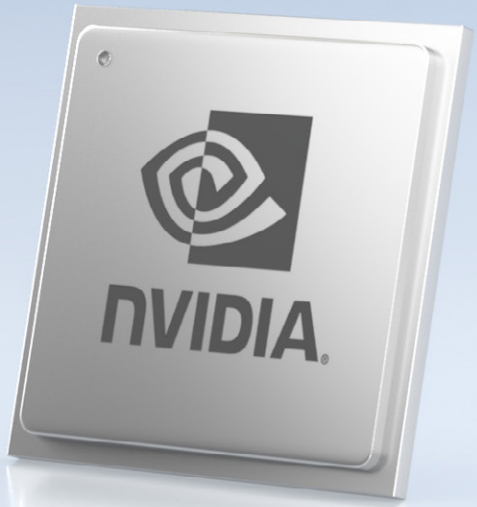
# NVIDIA CONNECTX-7 400G ETHERNET

## SMART NETWORK ACCELERATION FOR SECURITY, CLOUD AND ENTERPRISE




## ACCELERATED NETWORKING AND SECURITY FOR THE MOST ADVANCED CLOUD WORKLOADS

The NVIDIA® ConnectX®-7 SmartNIC is optimized to deliver accelerated networking for modern cloud, artificial intelligence, and traditional enterprise workloads. ConnectX-7 provides a broad set of software-defined, hardware accelerated networking, storage, security, and management capabilities which enable organizations to transform and secure their IT infrastructures.

Extending the tradition of NVIDIA's industry leading innovation for networking, ConnectX-7, is available in 1, 2, or 4-port configurations and delivers up to 400Gb/s of bandwidth. With features such as NVIDIA ASAP$^2$ - Accelerated Switching and Packet Processing®, advanced RoCE, NVIDIA GPUDirect® Storage, and in-line hardware acceleration for TLS/IPsec/MACsec encryption/decryption, ConnectX-7 empowers agile and high-performance solutions from edge to core data centers and clouds, all while enhancing network security and reducing the total cost of ownership.

Available in PCIe and OCP3.0 form factors, ConnectX-7 empowers solutions for cloud, hyperscale, and enterprise networking.

### PRODUCT SPECIFICATIONS

| | |
|---|---|
| Max Total Bandwidth | **400Gb/s** |
| Supported Ethernet Speeds | **10/25/40/50/100/ 200/400GbE** |
| Number of Network Ports | **1/2/4** |
| Network Interface Technologies | **NRZ (10/25G) / PAM4 (50/100G)** |
| Host Interface | **PCIe Gen5.0 x16/ x32** |
| Cards Form Factors | **PCIe FHHL/ HHHL, OCP3.0 SFF** |
| Network Interfaces | **SFP56, QSFP56, QSFP56-DD, QSFP112, SFP112** |

### Accelerate Software-Defined Networking

With NVIDIA ConnectX-7 ASAP$^2$ technology built-in, accelerates software-defined networking with no CPU penalty, delivering up to 250Mpps of DPDK performance.

### Provide Security from Edge to Core

Hardware engines in ConnectX-7 offload and accelerate security, with in-line encryption/decryption of TLS, IPsec, and MACsec.

### Enhance Storage Performance

ConnectX-7 enables high-performance storage and data access with RoCE and GPUDirect Storage and accelerates NVMe-oF over both RoCE and TCP.

### Enable Precision Timing

ConnectX-7 provides extremely accurate time synchronization for data-center applications and timing-sensitive infrastructures

# FEATURES

## Network Interface

- Up to 4 network ports supporting NRZ, PAM4 (50G and 100G), in various ports configurations:
- 1 x 10/25/40/50/100/200/400GbE
- 2 x 10/25/40/50/100/200/400GbE
- 4 x 10/25/40/50/100/200GbE
- Up to 400Gb/s total bandwidth

## Host Interface

- 32 lanes of PCIe Gen 5.0, 4.0, 3.0, 2.0, 1.1
- 32.0, 16.0, 8.0, 5.0, 2.5 GT/s link rate
- Integrated PCI switch
- NVIDIA Multi-HostTM and NVIDIA Socket DirectTM (up to 8 hosts)
- MSI/MSI-X mechanisms
- Advanced PCIe capabilities
- 8 physical functions

## ASAP²

- SDN acceleration for:
  - Bare metal
  - Virtualization
  - Containers
- Single Root IOV (SR-IOV) and VirtIO acceleration
- Support up to 2,000 virtual functions
- Support for MPLS and GTP tunneling
- Encap/decap of VXLAN, NVGRE, Geneve, eCPRI, and more
- Stateless offloads for overlay tunnels
- Full hardware offload for OVS data plane
- Flow update through RTE_Flow or TC_Flower
- VMware NSX-T N-VDS acceleration
- Rich classification engine (L2 to L4)
- Flex-parser: user-defined classification
- Hardware offload for:
  - Connection tracking (L4 firewall)
  - NAT
  - Header rewrite
  - Mirroring
  - Sampling
  - Flow aging
  - Hierarchical QoS
  - Flow-based statistics

## Operating System Support

- In-box drivers for major operating systems:
  - Linux - RHEL, Ubuntu
  - Windows
  - FreeBSD
- Virtualization and containers
  - VMware ESX
  - Kubernetes
  - Docker

## VNF Acceleration

- Hardware offload programmable pipeline:
  - Packet classification on network layers L2 to L4 and tunneled traffic such as GTP and VXLAN
  - Packet dispatching to multiple cores
  - Multi-threaded API for concurrent update of offloaded rules
  - ASAP² accelerations/actions: counters, QoS, NAT, aging, mirroring, sampling, flow tag
  - Hairpin flow for full hardware offload
- Highly-scalable number of classifications and actions
- Application access to hardware statistics
- Application access to crypto offloads

## Cyber Security

- Inline hardware IPsec encryption and decryption
  - AES-GCM 128/256-bit key
  - IPsec over RoCE
- Inline hardware TLS encryption and decryption
  - AES-GCM 128/256-bit key
- Inline hardware MACsec encryption and decryption
  - AES-GCM 128/256-bit key
  - AES-GCM-XPN 128/256-bit key
- Data-at-rest AES-XTS encryption and decryption
  - AES-XTS 256/512-bit key
- Platform security
  - Secure boot with hardware root-of-trust
  - Secure firmware update
  - Flash encryption

## Stateless Offloads

- TCP/UDP/IP stateless offload
- LSO, LRO, checksum offload
- Receive Side Scaling (RSS) also on encapsulated packets
- Transmit Side Scaling (TSS)
- VLAN and MPLS tag insertion/stripping
- Receive flow steering

## Advanced Timing and Synchronization

- Advanced PTP
  - IEEE 1588v2 (any profile)
  - Meets G.8273.2 Class C standard
  - PTP hardware clock (PHC) (UTC format)
  - 12 nanosecond accuracy
  - Line rate hardware timestamp (UTC format)
- SyncE
  - Meets G.8262.1 (eEEC)
  - Configurable PPS In and configurable PPS Out
  - Time-triggered scheduling
  - PTP-based packet pacing
  - Time-based SDN acceleration (ASAP²)

## Storage Accelerations

- NVMe™ over Fabrics storage target offloads
- NVMe™ over TCP acceleration
- Storage protocols: iSER, NFSoRDMA, SMB Direct, NVMe-oF™, and more

## RDMA over Converged Ethernet

- RoCE
- Zero-Touch RoCE: no ECN, no PFC
- RoCE over overlay networks
- IPsec over RoCE
- Selective repeat
- GPUDirect
- Dynamically Connected Transport (DCT)
- Burst buffer offload

## Management and Control

- SMBus 2.0
- Network Controller Sideband Interface (NC-SI)
- NC-SI, MCTP over SMBus and MCTP over PCIe - Baseboard Management Controller interface
- PLDM for Monitor and Control DSP0248
- PLDM for Firmware Update DSP026
- I2C interface for device control and configuration
- General Purpose I/O pins
- SPI interface to flash
- JTAG IEEE 1149.1 and
- IEEE 1149.6

## Remote Boot

- Remote boot over Ethernet
- Remote boot over iSCSI
- UEFI support for x86 and Arm servers
- PXE boot

## Form Factors and Options

- PCIe HHHL/FHHL
- OCP 3.0 SFF

To learn more about the NVIDIA ConnectX SmartNICs visit **www.nvidia.com/en-us/networking/ethernet-adapters/**



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