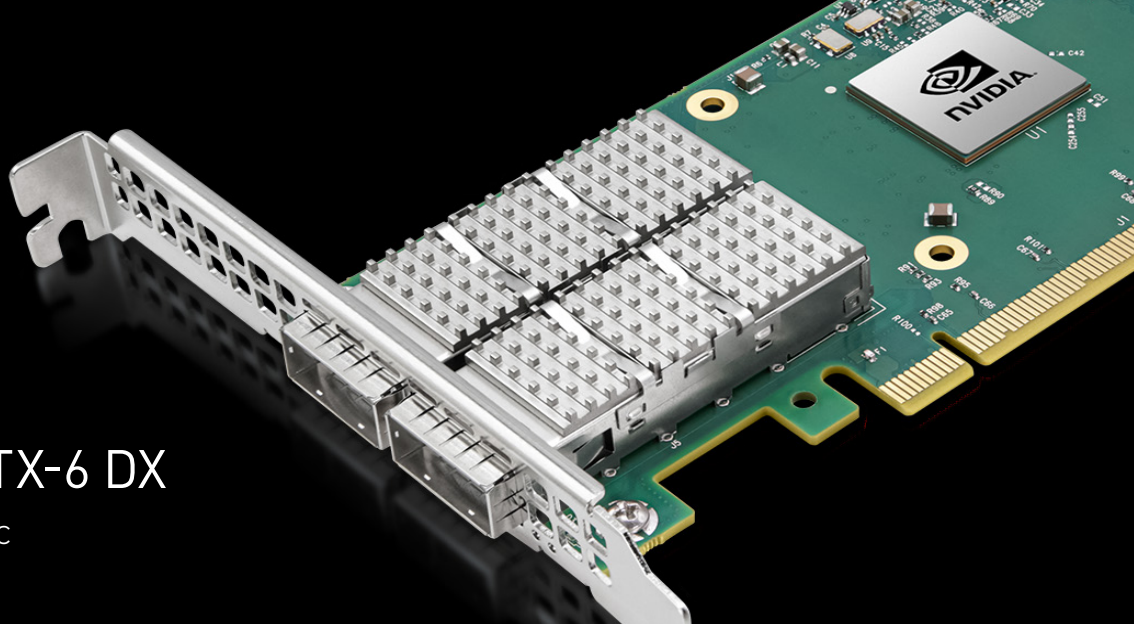
DATASHEET



NVIDIA CONNECTX-6 DX

Lenovo Ethernet Smartnic

NVIDIA® ConnectX®-6 Dx SmartNIC is the industry's most secure and advanced cloud network interface card to accelerate mission-critical data-center applications, such as security, virtualization, SDN/NFV, big data, machine learning, and storage. The SmartNIC provides up to two ports of 100Gb/s Ethernet connectivity and delivers the highest return on investment (ROI) of any smart network interface card.

ConnectX-6 Dx is a member of the world-class, award-winning ConnectX series of network adapters powered by leading 50Gb/s (PAM4) and 25/10Gb/s (NRZ) SerDes technology and novel capabilities that accelerate cloud and data-center payloads.

Security From Zero Trust To Hero Trust

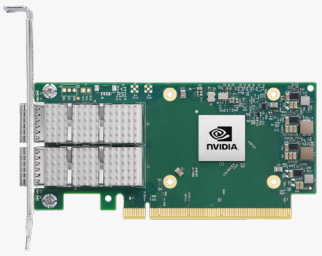
In an era where privacy of information is key and zero trust is the rule, ConnectX-6 Dx adapters offer a range of advanced built-in capabilities that bring security down to the endpoints with unprecedented performance and scalability, including:

- Probes & DoS Attack Protection – ConnectX-6 Dx enables a hardware-based L4 firewall by offloading stateful connection tracking through NVIDIA ASAP² - Accelerated Switch and Packet Processing®.
- NIC Security – Hardware Root-of-Trust (RoT) Secure Boot and secure firmware update using RSA cryptography, and cloning-protection, via a device-unique secret key.

Advanced Virtualization

ConnectX-6 Dx delivers another level of innovation to enable building highly efficient virtualized cloud data centers:

- Virtualization – ASAP² technology for vSwitch/vRouter hardware offload delivers orders of magnitude higher performance vs. software-based solutions. ConnectX-6 Dx ASAP² offers both SR-IOV and VirtIO in-hardware offload capabilities, and supports up to 8 million rules.
- Advanced Quality of Service – Includes traffic shaping and classification-based data policing.



SMARTNIC PORTFOLIO

- 1/10/25/40/50/100Gb/s Ethernet, PAM4/NRZ
- PCIe low-profile form factor
- QSFP56 connectors
- PCIe Gen 3.0/4.0 x16 host interface

KEY FEATURES

- Up to 100Gb/s bandwidth
- Message rate of up to 215 Mpps
- Sub 0.8 usec latency
- Flexible programmable pipeline for new network flows
- ASAP² - Accelerated Switching and Packet Processing for virtual switches/routers
- Overlay tunneling technologies
- Hardware Root-of-Trust and secure firmware update
- Connection Tracking offload
- Advanced RoCE capabilities
- Best in class PTP for TSN applications
- GPUDirect® for GPU-to-GPU communication
- Host chaining technology for economical rack design
- Platform agnostic: x86, Power, Arm
- ODCC compatible

Industry-leading RoCE

Following the ConnectX tradition of industry-leading RoCE capabilities, ConnectX-6 Dx adds another layer of innovation to enable more scalable, resilient and easy-to-deploy RoCE solutions.

- Zero Touch RoCE – Simplifying RoCE deployments, ConnectX-6 Dx allows RoCE payloads to run seamlessly on existing networks without requiring special configuration on the network (no PFC, no ECN). New features in ConnectX-6 Dx ensure resiliency and efficiency at scale of such deployments.
- Configurable Congestion Control – API to build user-defined congestion control algorithms, best serving various environments and RoCE and TCP/IP traffic patterns.

Best in Class PTP for Time Sensitive Applications

NVIDIA offers a full IEEE 1588v2 PTP software solution as well as time sensitive related features called 5T45G. PTP and 5T45G software solutions are designed to meet the most demanding PTP profiles. ConnectX-6 Dx incorporates an integrated Hardware Clock (PHC) that allows the device to achieve sub-20 nsec accuracy while offering various timing related functions, including time-triggered scheduling or time-based SND accelerations (time based ASAP²). Furthermore, 5T45G technology enables software applications to transmit front-haul (ORAN) compatible in high bandwidth. The PTP solution supports slave clock, master clock, and boundary clock.

Efficient Storage Solutions

With its NVMe-oF target and initiator offloads, ConnectX-6 Dx brings further optimization to NVMe-oF, enhancing CPU utilization and scalability. Additionally, ConnectX-6 Dx supports hardware offload for ingress/egress of T10-DIF/PI/CRC32/CRC64 signatures.

SOLUTIONS

- Cloud-native, Web 2.0, hyperscale
- Enterprise data-centers
- Cyber security
- Big data analytics
- Scale-out compute and storage infrastructure
- Telco and Network Function Virtualization (NFV)
- Cloud storage
- Machine Learning (ML) and Artificial Intelligence (AI)
- Media and Entertainment

Ordering Information

Max Network Speed	Interface Type	Supported Ethernet Speeds [GbE]	Host Interface [PCIe]	NVIDIA OPN	Lenovo OPN
2 x 100 GbE	QSFP56	1/10/25/40/50/100	Gen 4.0 x16	MCX623106AS-CDAT	4XC7A08248

Features*

Network Interface
- 2 x 25/50/100GbE

Host Interface
- PCIe Gen 4.0, 3.0, 2.0, 1.1
- 16.0, 8.0, 5.0, 2.5GT/s link rate
- 16 lanes of PCIe
- MSI/MSI-X mechanisms
- Advanced PCIe capabilities

Virtualization/Cloud Native
- Single Root IOV (SR-IOV) and VirtIO acceleration
  - Up to 1 K VFs per port
  - 8 PFs
- Support for tunneling
  - Encap/decap of VXLAN, NVGRE, Geneve, and more
  - Stateless offloads for Overlay tunnels

ASAP²
- SDN acceleration for:
  - Bare metal
  - Virtualization
  - Containers
- Full hardware offload for OVS data plane
- Flow update through RTE_Flow or TC_Flower
- OpenStack support
- Kubernetes support
- 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
  - Hierarchial QoS
  - Flow-based statistics

Platform Security
- Hardware root-of-trust
- Secure firmware update

Stateless Offloads
- TCP/UDP/IP stateless offload
- LSO, LRO, checksum offload
- Receive side scaling (RSS) also on encapsulated packet
- Transmit side scaling (TSS)
- VLAN and MPLS tag insertion/stripping
- Receive flow steering

Advanced Timing and Synchronization
- Advanced PTP
  - IEEE 1588v2 (any profile)
  - PTP hardware clock (PHC) (UTC format)
  - 16 nsec accuracy
  - Line rate hardware timestamp (UTC format)
- Time triggered scheduling
- PTP based packet pacing
- Time based SDN acceleration (ASAP²)
- Time sensitive networking (TSN)

Storage Accelerations
- NVMe over Fabric offloads for target
- Storage protocols: iSER, NFSoRDMA, SMB Direct, NVMe-oF, and more
- T-10 Dif/Signature Handover

RDMA over Converged Ethernet (RoCE)
- RoCE v1/v2
- Zero Touch RoCE: no ECN, no PFC
- RoCE over overlay networks
- Selective repeat
- Programmable congestion control interface
- GPUDirect®
- Burst buffer offload

Management and Control
- PLDM for Monitor and Control DSP0248
- PLDM for Firmware Update DSP026
- I²C interface for device control and configuration

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

Standards
- IEEE 802.3cd, 50, 100 and 200GB Ethernet
- IEEE 802.3bj, 802.3bm 100GB Ethernet
- IEEE 802.3by, 25, 50GB Ethernet supporting all FEC modes
- IEEE 802.3ba 40GB Ethernet
- IEEE 802.3ae 10GB Ethernet
- IEEE 802.3az Energy Efficient Ethernet (supports only "Fast-Wake" mode)
- IEEE 802.3ap based auto-negotiation and KR startup
- IEEE 802.3ad, 802.1AX Link Aggregation
- IEEE 802.1Q, 802.1P VLAN tags and priority
- IEEE 802.1Qaz (ETS)
- IEEE 802.1Qbb (PFC)
- IEEE 802.1Qbg
- 25/50 Ethernet Consortium "Low Latency FEC" for 50GE/100GE/200GE PAM4 links
- PCI Express Gen 3.0 and 4.0

* This section describes hardware features and capabilities. Please refer to the driver and firmware release notes for feature availability.

Learn more

Learn more about the **NVIDIA ConnextX-6 Dx**

NVIDIA