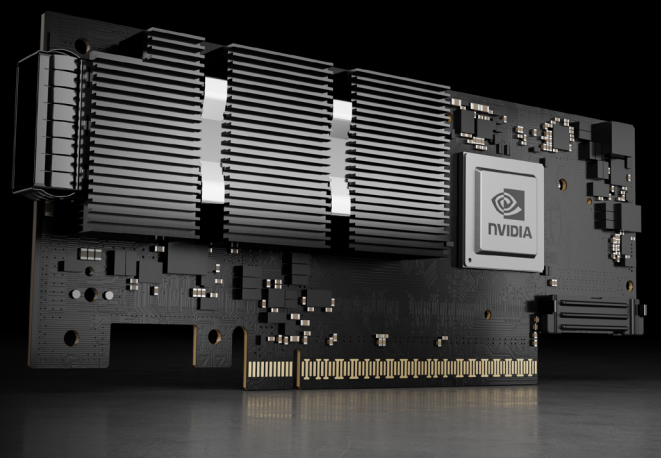
Datasheet

ConnectX-7 400G Adapters

Smart, Accelerated Networking for Modern Data Center Infrastructures



The NVIDIA® ConnectX®-7 family of Remote Direct Memory Access (RDMA) network adapters supports InfiniBand and Ethernet protocols and a range of speeds up to 400Gb/s. It enables a wide range of smart, scalable, and feature-rich networking solutions that address traditional enterprise needs up to the world's most-demanding AI, scientific computing, and hyperscale cloud data center workloads.

Accelerated Networking and Security

ConnectX-7 provides a broad set of software-defined, hardware-accelerated networking, storage, and security capabilities which enable organizations to modernize and secure their IT infrastructures. Moreover, ConnectX-7 empowers agile and high-performance solutions from edge to core data centers to clouds, all while enhancing network security and reducing the total cost of ownership.

Accelerate Data-Driven Scientific Computing

ConnectX-7 provides ultra-low latency, extreme throughput, and innovative NVIDIA In-Network Computing engines to deliver the acceleration, scalability, and feature-rich technology needed for today's modern scientific computing workloads.

Features*

InfiniBand Interface

- InfiniBand Trade Association Spec 1.5 compliant
- RDMA, send/receive semantics
- 16 million input/output (IO) channels
- 256 to 4Kbyte maximum transmission unit (MTU), 2Gbyte messages

Ethernet Interface

- Up to 4 network ports supporting NRZ, PAM4 (50G and 100G), in various configurations
- Up to 400Gb/s total bandwidth
- RDMA over Converged Ethernet (RoCE)

Enhanced InfiniBand Networking

- Hardware-based reliable transport
- Extended Reliable Connected (XRC)
- Dynamically Connected Transport (DCT)
- GPUDirect® RDMA
- GPUDirect Storage
- Adaptive routing support
- Enhanced atomic operations
- Advanced memory mapping, allowing user mode registration (UMR)
- On-demand paging (ODP), including registration-free RDMA memory access
- Enhanced congestion control
- Burst buffer offload
- Single root IO virtualization (SR-IOV)
- Optimized for HPC software libraries including:
  - NVIDIA HPC-X®, UCX®, UCC, NCCL, OpenMPI, MVAPICH, MPICH, OpenSHMEM, PGAS
- Collective operations offloads
- Support for NVIDIA Scalable Hierarchical Aggregation and Reduction Protocol (SHARP)™
- Rendezvous protocol offload
- In-network on-board memory

*Refer to the relevant **driver release notes** for feature availability.

Product Specifications

Supported network protocols	**InfiniBand, Ethernet**
InfiniBand speeds	**NDR 400Gb/s, HDR 200Gb/s, EDR 100Gb/s**
Ethernet speeds	**400GbE, 200GbE, 100GbE, 50GbE, 25GbE, 10GbE**
Number of network ports	**1/2/4**
Host interface	**PCIe Gen5, up to x32 lanes**
Form factors	**PCIe HHHL, FHHL, OCP3.0 TSFF, SFF**
Interface technologies	**NRZ (10G, 25G) PAM4 (50G, 100G)**

Accelerate Software-Defined Networking

NVIDIA ASAP² technology accelerates software-defined networking, delivering line-rate performance with no CPU penalty.

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 and efficient data storage by leveraging RDMA/RoCE, GPUDirect Storage, and hardware-based NVMe-oF offload engines.

Enable Precision Timing

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

Enhanced Ethernet Networking

- Zero-Touch RoCE
- ASAP² Accelerated Switch and Packet Processing™ for SDN and VNF acceleration
- Single Root I/O Virtualization (SR-IOV)
- VirtIO acceleration
- Overlay network acceleration: VXLAN, GENEVE, NVGRE
- Programmable flexible parser
- Connection tracking (L4 firewall)
- Flow mirroring, sampling and statistics
- Header rewrite
- Hierarchical QoS
- Stateless TCP offloads

Storage Accelerations

- Block-level encryption: XTS-AES 256/512-bit key
- NVMe over Fabrics (NVMe-oF)
- NVMe over TCP (NVMe/TCP)
- T10 Data Integrity Field (T10-DIF) signature handover
- SRP, iSER, NFS over RDMA, SMB Direct

Management and Control

- NC-SI, MCTP over SMBus, and MCTP over PCIe
- PLDM for Monitor and Control DSP0248
- PLDM for Firmware Update DSP0267
- PLDM for Redfish Device Enablement DSP0218
- PLDM for FRU DSP0257
- SPDM DSP0274
- Serial Peripheral Interface (SPI) to flash
- JTAG IEEE 1149.1 and IEEE 1149.6

Remote Boot

- Remote boot over InfiniBand
- Remote boot over Internet Small Computer Systems Interface (iSCSI)
- Unified Extensible Firmware Interface (UEFI)
- Preboot Execution Environment (PXE)

Cybersecurity

- 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
- Platform security: secure boot with hardware root-of-trust, secure firmware update, flash encryption, and device attestation

Advanced Timing and Synchronization

- Advanced PTP: IEEE 1588v2 (any profile), G.8273.2 Class C, 12 nanosecond accuracy, line-rate hardware timestamp (UTC format)
- SyncE: Meets G.8262.1 (eEEC)
- Configurable PPS In and Out
- Time-triggered scheduling
- PTP-based packet pacing

Compatibility

PCI Express Interface

- PCIe Gen 5.0 compatible, 32 lanes
- Support for PCIe bifurcation
- NVIDIA Multi-Host™ supports connection of up to 4x hosts
- Transaction layer packet (TLP) processing hints (TPH)
- PCIe switch Downstream Port Containment (DPC)
- Support for MSI/MSI-X mechanisms
- Advanced error reporting (AER)
- Access Control Service (ACS) for peer-to-peer secure communication
- Process Address Space ID (PASID)
- Address translation services (ATS)
- Support for SR-IOV

Operating Systems/Distributions

- In-box drivers for major operating systems:
  - Linux: RHEL, Ubuntu
  - Windows
- Virtualization and containers
  - VMware ESXi (SR-IOV)
  - Kubernetes

Portfolio and Ordering Information

The portfolio of ConnectX-7 network adapters and ordering information is available in the ConnectX-7 user manuals:

- PCIe adapters manual: **docs.nvidia.com/networking/display/ConnectX7VPI**
- OCP 3.0 adapters manual: **docs.nvidia.com/networking/display/ConnectX7VPIOCP3**

Learn more

To learn more about InfiniBand adapters visit: **nvidia.com/infiniband-adapters**

To learn more about Ethernet SmartNICs visit: **nvidia.com/ethernet-adapters**

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