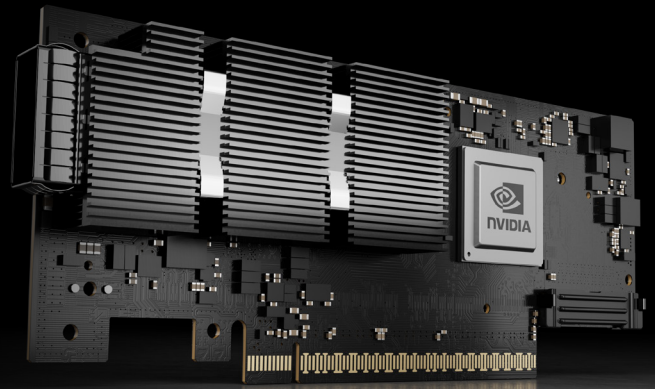




# ConnectX-7 400G Adapters

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

## Product Specifications

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



### Accelerate Software-Defined Networking

NVIDIA ASAP<sup>2</sup> 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.

\*Refer to the relevant [driver release notes](#) for feature availability.

## Enhanced Ethernet Networking

- > Zero-Touch RoCE
- > ASAP<sup>2</sup> 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
- > Time-Sensitive Networking (TSN)

## 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](https://docs.nvidia.com/networking/display/ConnectX7VPI)
- > OCP 3.0 adapters manual: [docs.nvidia.com/networking/display/ConnectX7VPIOCP3](https://docs.nvidia.com/networking/display/ConnectX7VPIOCP3)

[Learn more](#)

To learn more about InfiniBand adapters visit: [nvidia.com/infiniband-adapters](https://nvidia.com/infiniband-adapters)

To learn more about Ethernet SmartNICs visit: [nvidia.com/ethernet-adapters](https://nvidia.com/ethernet-adapters)