

Host Channel Adapters (HCAs)

Single/Dual-Port InfiniBand HCA Cards with PCI Express Gen. 1/Gen. 2



Overview

The HCA product family is a complete set of high-performance 4X InfiniBand Host Channel Adapter (HCA) cards that enable industry-standard servers to access the full performance of high-speed (20–40 Gb/s) InfiniBand fabrics, with latency as low as 1 microsecond. HCAs support the industry's widest variety of host interfaces, InfiniBand rates and upper-layer protocols to meet the requirements of a broad range of applications and computing environments. All HCAs are provided with the industry-standard PCI Express host interfaces, and may have one or two 4X InfiniBand ports depending on the ordered HCA type: InfiniHost III Lx, ConnectX or ConnectX-2.

HCAs are part of Voltaire's end-to-end solution. They support network, cluster and storage connectivity over an InfiniBand fabric, and feature device drivers for Linux (OFED) and Microsoft Windows (WinOF). Voltaire drivers include a comprehensive suite of upper-layer protocols that are ideal for high-performance computing clusters, utility computing, grids and enterprise data center applications, including Oracle 10g/11g. In addition, Voltaire acceleration products boost application performance and exploit the full capabilities of InfiniBand HCAs.

Both the Voltaire OFED and WinOF (MS WHQL certified) suites enable any application to utilize the exceptional performance of RDMA, which is featured in the hardware. They allow both HPC and enterprise applications to run significantly faster, leveraging bandwidth of more than 2500 MB/sec with minimal latency and reduced CPU utilization.

ConnectX-2

The ConnectX-2 HCA card reaches rates of up to 40 Gb/s over InfiniBand. It simplifies network deployment by consolidating clustering, communications, storage, and management I/O, and by providing enhanced performance in virtualized server environments. Servers with PCI Express Gen. 2.0 and 5GT/s can fully utilize the 40 Gb/s capacity, balancing the I/O requirements of these high-end servers. Key features of ConnectX-2 cards include:

- 1us MPI ping latency
- Two 20 Gb/s (DDR) or 40 Gb/s (QDR) InfiniBand ports
- QSFP connectors for QDR ports
- InfiniBand Trade Association (IBTA) specification 1.2.1 compliant (interoperability)
- PCI Express 2.0 (up to 5GT/s) host interface
- CPU offload of transport operations
- Fine grained end-to-end QoS
- Hardware-based I/O virtualization
- TCP/UDP/IP stateless offload
- Fibre Channel encapsulation (FCoIB or FCoE)

InfiniBand HCA benefits include:

- Top-class cluster performance
- High-performance networking and storage access
- Guaranteed bandwidth and low-latency services
- High Availability (HA) hardware support
- Reliable data transport
- End-to-end storage integrity
- I/O consolidation
- Virtualization acceleration
- Scaling to tens-of-thousands of nodes



Host Channel Adapters (HCAs)

ConnectX

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Key features of ConnectX cards include:

- 1.2us MPI ping latency
- Two 20 Gb/s (DDR) or 40 Gb/s (QDR) InfiniBand ports
- QSFP connectors for QDR ports
- InfiniBand Trade Association (IBTA) Specification 1.2 compliant (interoperability)
- PCI Express 2.0 (up to 5GT/s) host interface
- CPU offload of transport operations
- End-to-End QoS and congestion control
- Hardware-based I/O virtualization
- TCP/UDP/IP stateless offload



InfiniHost III Lx

The InfiniHost III Lx single-port 4X InfiniBand card features the MemFree technology, which removes the requirement for local memory on the PCI Express adapter card itself. Instead, these cards use the system memory to store connection information, resulting in lower power, lower adapter card cost, and smaller physical size.

InfiniHost III Lx HCA cards utilize the InfiniBand architecture memory protection and translation tables, as well as hardware transport, significantly reducing CPU overhead. Key features of InfiniHost III Lx cards include:

- Single 20 Gb/s 4X InfiniBand port
- Integrated Serializer/Deserializer (SerDes)
- InfiniRISCTM embedded RISC processors
- PCI Express Revision 1.0a compatible card
- PCI Express x8 (20+20 Gbps Full Duplex) interface
- IBTA version 1.2 Compatible
- Copper InfiniBand Connector (MicroGigaCN) with media detect circuit for optional fiber media adapter
- ROHS-R5 compliant software support



ConnectX Technical Specifications

Infiniband

- IBTA Specification 1.2.1 compliant
- 10, 20, or 40Gb/s per port
- RDMA, Send/Receive semantics
- Hardware-based congestion control
- Atomic operations
- 16 million I/O channels
- 9 virtual lanes: 8 data + 1 management

Enhanced Infiniband

- Hardware-based reliable transport
- Hardware-based reliable multicast
- Collective operations offloads
- Extended Reliable Connected transport
- Enhanced Atomic operations
- Fine grained end-to-end QoS

Hardware-Based I/O Virtualization

- Single Root IOV
- Address translation and protection
- Multiple queues per virtual machine
- VMware NetQueue support

Additional CPU Offloads

- TCP/UDP/IP stateless offload
- Intelligent interrupt coalescence
- Compliant to Microsoft RSS and NetDMA

Storage Support

- Fibre Channel over InfiniBand (FCoB) or Ethernet (FCoE)

CPU Compatibility

- AMD X86, X86_64
- Intel X86, EM64T, IA-32, IA-64
- SPARC
- PowerPC, MIPS, and Cell

PCI Express Interface

- PCIe Base 2.0 compliant, 1.1 compatible
- 2.5GT/s or 5.0GT/s link rate x8 (20+20Gbps or 40+40Gbps bidirectional bandwidth)
- Fits x8 or x16 slots
- Support for MSI/MSI-X mechanisms

Connectivity

- Interoperable with InfiniBand switches
- 20m+ (10Gb/s), 10m+ (20Gb/s) or 5m+ (40Gb/s) of copper cable
- microGiGaCN or QSFP connectors
- External optical media adapter and active cable support

Management And Tools

- Voltaire Host-Based Subnet Manager
- Firmware and debug tools (MFT, IBADM)

Operating Systems/Distributions

- Novell SLES, Red Hat Enterprise Linux (RHEL), Fedora, and other Linux distributions
- Microsoft Windows Server 2003/2008/CCS 2003
- OpenFabrics Enterprise Distribution (OFED)
- OpenFabrics Windows Distribution (WinOF)
- VMware ESX Server 3.5/ vSphere 4.0

Supported Protocols

- Open MPI
- TCP/UDP, IPoIB, SDP, RDS
- iSER, RDMA, FCoB, FCoE
- uDAPL

Safety

- USA/Canada: cTUVus UL
- EU: IEC60950
- Germany: TUV/GS
- International: CB Scheme

EMC (Emissions)

- USA: FCC, Class A
- Canada: ICES, Class A
- EU: EN55022, Class A
- EU: EN55024, Class A
- EU: EN61000-3-2, Class A
- EU: EN61000-3-3, Class A
- Japan: VCCI, Class A
- Taiwan: BSMI, Class A

Environmental

- EU: IEC 60068-2-64: Random Vibration
- EU: IEC 60068-2-29: Shocks, Type I / II
- EU: IEC 60068-2-32: Fall Test

Operating Conditions

- Operating temperature: 0 to 55° C
- Airflow: 200LFM @ 55° C
- Requires 3.3V, 12V supplies

Host Channel Adapters (HCAs)

Available HCA Models

Model	Voltaire P/N	Verbs Bandwidth (bytes)	Verbs Latency (microseconds)	Description
HCA 700Ex2-Q	HCA-30024	2456	0.97	Dual port ConnectX-2 PCI-EX Gen 2 4X QDR IB MemFree with Voltaire OFED/WinOF
HCA 700Ex2-Q-1	HCA-30025	2456	0.97	Single port ConnectX-2 PCI-EX Gen 2 4X QDR IB MemFree with Voltaire OFED/WinOF
HCA 600Ex2-Q	HCA-30014	2456	0.97	Dual port 8X PCI-EX Gen 2 4X QDR IB MemFree with Voltaire OFED/WinOF
HCA 600Ex2-Q-1	HCA-30021	2456	0.97	Single port 8X PCI-EX Gen 2 4X QDR IB MemFree with Voltaire OFED/WinOF
HCA 520Ex2-D	HCA-30017	1867.54	1.04	Dual port 8X PCI-EX Gen 2 4X DDR IB MemFree with Voltaire OFED/WinOF
HCA 520Ex2-D-1	HCA-30022	1867.54	1.04	Single port 8X PCI-EX Gen 2 4X DDR IB MemFree with Voltaire OFED/WinOF
HCA 500Ex-D	HCA-00001	1239.84	1.15	Dual port 8X PCI-EX Gen 1 4X DDR IB MemFree with Voltaire OFED/WinOF
HCA 500Ex-D-1	HCA-30020	1239.84	1.15	Single port 8X PCI-EX Gen 1 4X DDR IB MemFree with Voltaire OFED/WinOF
HCA 410Ex-D-GS	501S00046			Single port 8X PCI-EX Gen 1 4X DDR IB MemFree with Voltaire OFED/WinOF

Notes:

- QDR HCAs are provided with QSFP connectors.
- All HCA cards are provided with one year hardware warranty. Support for the OpenFabrics Enterprise Distribution (OFED) software package can be purchased separately.
- To obtain the latest HCA firmware version, refer to the Mellanox Technologies website at: www.mellanox.com

Which HCA to Choose

Requirement	Ideal HCA(s)
Best performance	HCA 700Ex2-Q (single/dual port) HCA 600Ex-D (single/dual port) HCA 520Ex-D (single/dual port) HCA 500Ex-D (single/dual port)
Low cost	HCA 410Ex-D-GS
High availability	2 x single-port HCAs instead of 1 x dual-port HCAs: HCA 700Ex2-Q-1 HCA 600Ex-D-1 HCA 520Ex-D-1 HCA 500Ex-D-1



Contact Voltaire to Learn More

1.800.865.8247
info@voltaire.com
www.voltaire.com

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