



# 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 Gbps) InfiniBand fabrics, with latency as low as 1.3 microseconds. 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, InfiniHost III Ex, or ConnectX.

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 is 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.

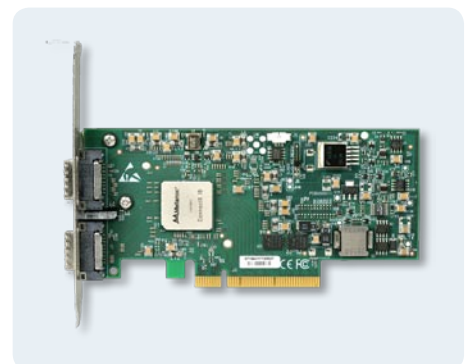
## ConnectX

The ConnectX HCA card reaches rates of up to 40 Gbps 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 Gbps capacity, balancing the I/O requirements of these high-end servers. Key features of ConnectX cards include:

- 1.2us MPI ping latency
- Two 20 Gbps (DDR) or 40 Gbps (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

## 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

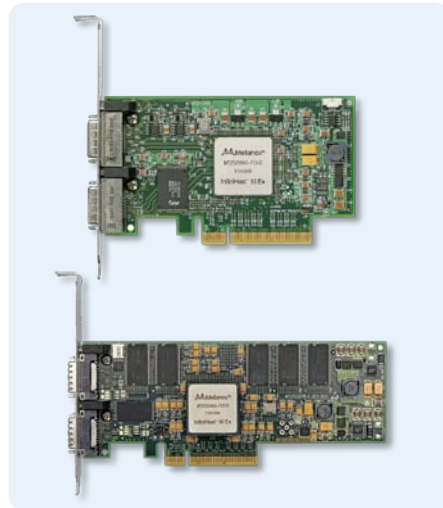


# Host Channel Adapters (HCAs)

## InfiniHost III Ex

The InfiniHost III Ex dual-port 4X InfiniBand card features remote direct memory access (RDMA), hardware transport, and advanced per queue pair (QP) QoS services. All InfiniHost III Ex cards can be directly inserted into PCI Express x8 or wider slots of standard servers, blade servers, storage and communications platforms. Key features of InfiniHost III Ex cards include:

- Two 20 Gbps (MHGA28-XTC and MHGA28-1TC) 4X InfiniBand Ports
- Integrated Serializer/Deserializer (SerDes) interfaces
- InfiniRISCTM embedded RISC processors
- PCI ExpressHCA 400Ex-D-M revision 1.0a compatible card
- PCI Express x8 (20 + 20 Gbps full duplex) interface
- IBTA version 1.2 compatible
- Copper InfiniBand connectors (MicroGigaCN) with media detect circuit for optional fiber media adapter
- ROHS-R5 Compliant

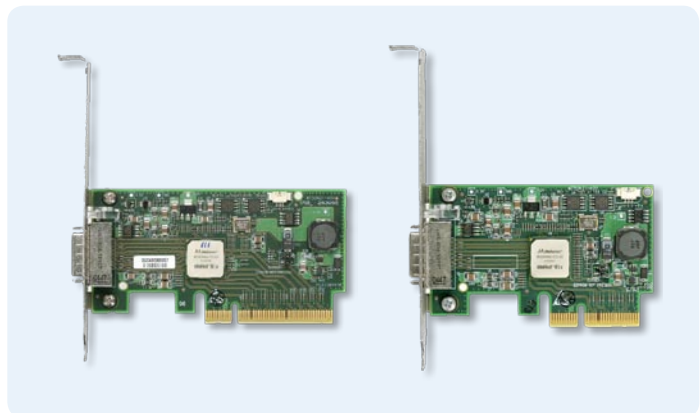


## InfiniHost III Lx

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 Gbps (MHGS18) 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 (MHES18, MHGS18) IBTA version 1.2 Compatible
- Copper InfiniBand Connector (MicroGigaCN) with media detect circuit for optional fiber media adapter
- ROHS-R5 Compliant software support



# Host Channel Adapters (HCAs)

## ConnectX Technical Specifications

### Infiniband

- IBTA Specification 1.2 compliant
- 10, 20, or 40Gbps per port
- RDMA, Send/Receive semantics
- Hardware-based congestion control
- Atomic operations
- 16 million I/O channels
- 256 to 4Kbyte MTU
- 2GB messages
- 9 virtual lanes: 8 data + 1 management

### Enhanced Infiniband

- Hardware-based reliable transport
- Hardware-based reliable multicast
- Scalable Reliable Connected transport
- Enhanced Atomic operations
- Service oriented I/O
- Fine grained end-to-end QoS

### Hardware-Based I/O Virtualization

- Address translation and protection
- Multiple queues per virtual machine
- Native OS performance
- Complementary to Intel and AMD I/OMMU

### Additional CPU Offloads

- TCP/UDP/IP stateless offload
- Intelligent interrupt coalescence
- Full support for Intel I/OAT
- Compliant to Microsoft RSS and NetDMA

### Storage Support

- T10-compliant Data Integrity Field support
- Fibre Channel over InfiniBand (FCoIB)

### 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+ (10Gbps), 10m+ (20Gbps) or 5m+ (40Gbps) 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), CentOS
- Microsoft Windows Server 2003/2008/CCS 2003
- OpenFabrics Enterprise Distribution (OFED)
- OpenFabrics Windows Distribution (WinOF)

### Supported Protocols

- MPI
- IPoIB, SDP, RDS
- iSER, FCoIB
- uDAPL

### Safety

- USA/Canada: cTUVus UL
- EU: IEC60950
- 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
- Korea: MIC, 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

# Host Channel Adapters (HCAs)

## Available HCA Models

Model	Voltaire P/N	Verbs Bandwidth (bytes)	Verbs Latency (microseconds)	Description
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 400Ex-D-GS	501S00047	1254.1	2.81	Dual port 8X PCI-EX Gen 1 4X DDR IB 128MB with Voltaire OFED/WinOF
HCA 400Ex-D-M	501S00071	1251.43	2.51	Dual 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](http://www.mellanox.com)

## Which HCA to Choose

Requirement	Ideal HCA(s)
Best performance	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 600Ex-D-1 HCA 520Ex-D-1 HCA 500Ex-D-1



**Contact Voltaire to Learn More**

1.800.865.8247  
[info@voltaire.com](mailto:info@voltaire.com)  
[www.voltaire.com](http://www.voltaire.com)

©2009 Voltaire Inc. All rights reserved. Voltaire and the Voltaire logo are registered trademarks of Voltaire Inc. Grid Director is a trademark of Voltaire Inc. Other company, product, or service names are the property of their respective owners.