

# ConnectX<sup>®</sup>-2 VPI with CORE-Direct<sup>®</sup> Technology

Single/Dual-Port Adapters with *Virtual Protocol Interconnect*<sup>®</sup>

ConnectX-2 adapter cards with *Virtual Protocol Interconnect* (VPI) supporting InfiniBand and Ethernet connectivity provide the highest performing and most flexible interconnect solution for Enterprise Data Centers, High-Performance Computing, and Embedded environments.

Clustered data bases, parallel processing, transactional services and high-performance embedded I/O applications will achieve significant performance improvements resulting in reduced completion time and lower cost per operation. ConnectX-2 with VPI also simplifies network deployment by consolidating cables and enhancing performance in virtualized server environments.

## **Virtual Protocol Interconnect**

VPI-enabled adapters make it possible for any standard networking, clustering, storage, and management protocol to seamlessly operate over any converged network leveraging a consolidated software stack. With auto-sense capability, each ConnectX-2 port can identify and operate on InfiniBand, Ethernet, or Data Center Bridging (DCB) fabrics. FlexBoot™ provides additional flexibility by enabling servers to boot from remote InfiniBand or LAN storage targets. ConnectX-2 with VPI and FlexBoot simplifies I/O system design and makes it easier for IT managers to deploy infrastructure that meets the challenges of a dynamic data center.

## **World-Class Performance**

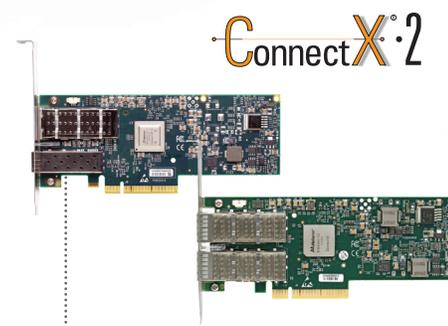
**InfiniBand** — ConnectX-2 delivers low latency, high bandwidth, and computing efficiency for performance-driven server and storage clustering applications. Efficient computing is achieved by offloading from the CPU routine activities which allows more processor power for the application.

Network protocol processing and data movement overhead such as InfiniBand RDMA and Send/Receive semantics are completed in the adapter without CPU intervention. CORE-Direct brings the next level of performance improvement by offloading application overhead (e.g. MPI collectives operations), such as data broadcasting and gathering as well as global synchronization communication routines. GPU communication acceleration provides additional efficiencies by eliminating unnecessary internal data copies to significantly reduce application run time. ConnectX-2 advanced acceleration technology enables higher cluster efficiency and large scalability to tens-of-thousands of nodes.

## **RDMA over Converged Ethernet** —

ConnectX-2 utilizing IBTA RoCE technology delivers similar low-latency and high-performance over Ethernet networks. Leveraging Data Center Bridging capabilities, RoCE provides efficient low-latency RDMA services over Layer 2 Ethernet. The RoCE software stack maintains existing and future compatibility with bandwidth and latency sensitive applications. With link-level interoperability in existing Ethernet infrastructure, Network Administrators can leverage existing data center fabric management solutions.

**TCP/UDP/IP Acceleration** — Applications utilizing TCP/UDP/IP transport can achieve industry-leading throughput over InfiniBand or 10GbE. The hardware-based stateless offload



## HIGHLIGHTS

### **BENEFITS**

- One adapter for InfiniBand, 10 Gigabit Ethernet or Data Center Bridging fabrics
- World-class cluster performance
- High-performance networking and storage access
- Guaranteed bandwidth and low-latency services
- Reliable transport
- I/O consolidation
- Virtualization acceleration
- Scales to tens-of-thousands of nodes

### **KEY FEATURES\***

- Virtual Protocol Interconnect
- 1us MPI ping latency
- Selectable 10, 20, or 40GbE/s InfiniBand or 10 Gigabit Ethernet per port
- Single- and Dual-Port options available
- PCI Express 2.0 (up to 5GT/s)
- CPU offload of transport operations
- CORE-Direct application offload
- GPU communication acceleration
- End-to-end QoS and congestion control
- Hardware-based I/O virtualization
- Fibre Channel encapsulation (FCoIB or FCoE)
- RoHS-R6

engines in ConnectX-2 reduce the CPU overhead of IP packet transport, freeing more processor cycles to work on the application.

**I/O Virtualization** — ConnectX-2 with Virtual Intelligent Queuing (Virtual-IQ) technology provides dedicated adapter resources and guaranteed isolation and protection for virtual machines (VM) within the server. I/O virtualization with ConnectX-2 gives data center managers better server utilization and LAN and SAN unification while reducing cost, power, and cable complexity.

**Storage Accelerated** — A consolidated compute and storage network achieves significant cost-performance advantages over multi-fabric networks. Standard block and file access protocols can leverage InfiniBand RDMA for high-performance storage access. T11 compliant encapsulation (FCoIB or FCoE) with full hardware offloads simplifies the storage network while keeping existing Fibre Channel targets.

**Software Support**

All Mellanox adapter cards are supported by a full suite of drivers for Microsoft Windows, Linux distributions, VMware, and Citrix XENServer. ConnectX-2 VPI adapters support OpenFabrics-based RDMA protocols and software. Stateless offload are fully interoperable with standard TCP/UDP/IP stacks. ConnectX-2 VPI adapters are compatible with configuration and management tools from OEMs and operating system vendors.



**FEATURE SUMMARY**

**INFINIBAND**

- IBTA Specification 1.2.1 compliant
- RDMA, Send/Receive semantics
- Hardware-based congestion control
- Atomic operations
- 16 million I/O channels
- 256 to 4Kbyte MTU, 1Gbyte messages
- 9 virtual lanes: 8 data + 1 management

**ENHANCED INFINIBAND**

- Hardware-based reliable transport
- Collective operations offloads
- GPU communication acceleration
- Hardware-based reliable multicast
- Extended Reliable Connected transport
- Enhanced Atomic operations

**STORAGE SUPPORT**

- T11.3 FC-BB-5 FCoE

**FLEXBOOT™ TECHNOLOGY**

Remote boot over InfiniBand, Ethernet, iSCSI

**ETHERNET**

- IEEE 802.3ae 10 Gigabit Ethernet
- IEEE 802.3ad Link Aggregation and Failover
- IEEE 802.1Q, .1p VLAN tags and priority
- IEEE P802.1au D2.0 Congestion Notification
- IEEE P802.1az D0.2 ETS
- IEEE P802.1bb D1.0 PFC
- Jumbo frame support (10KB)
- 128 MAC/VLAN addresses per port

**HARDWARE-BASED I/O VIRTUALIZATION**

- Single Root IOV
- Address translation and protection
- Dedicated adapter resources
- Multiple queues per virtual machine
- Enhanced QoS for vNICs
- VMware NetQueue support

**ADDITIONAL CPU OFFLOADS**

- RDMA over Converged Ethernet
- TCP/UDP/IP stateless offload
- Intelligent interrupt coalescence

**COMPATIBILITY**

**PCI EXPRESS INTERFACE**

- PCIe Base 2.0 compliant, 1.1 compatible
- Auto-negotiates to x8, x4, x2, or x1
- Support for MSI/MSI-X mechanisms

**CONNECTIVITY**

- Interoperable with IB or 10GbE switches
- microGiGaCN or QSFP connectors
- Passive Copper cables (Direct Attach)
- External optical media adapter and active cable support
- QSFP to SFP+ connectivity through QSA

**MANAGEMENT AND TOOLS**

**INFINIBAND**

- OpenSM
- Interoperable with third-party subnet mng Firmware and debug tools (MFT, IBDIAG)

**ETHERNET**

- MIB, MIB-II, MIB-II Ext., RMON, RMON 2
- Configuration and diagnostic tools

**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

**PROTOCOL SUPPORT**

- Open MPI, OSU MVA PICH, Intel MPI, MS MPI, Platform MPI
- TCP/UDP, EoIB, IPoIB, SDP, RDS
- SRP, iSER, NFS RDMA, FCoIB, FCoE
- uDAPL

Ordering Part Number	Description	Power (Typ)
MHRH19B-XTR	Single 4X QSFP 20GbE/s InfiniBand	6.7W
MHQH19B-XTR	Single 4X QSFP 40GbE/s InfiniBand	7.0W
MHRH29B-XTR	Dual 4X QSFP 20GbE/s InfiniBand	8.1W (both ports)
MHQH29C-XTR	Dual 4X QSFP 40GbE/s InfiniBand	8.8W (both ports)
MHZH29B-XTR	4X QSFP 40GbE/s InfiniBand, SFP+ 10GbE	8.0W (both ports)

\*This product brief describes hardware features and capabilities. Please refer to the driver release notes on [mellanox.com](http://mellanox.com) for feature availability or contact your local sales representative.  
\*Product images may not include heat sync assembly; actual product may differ.



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