ConnectX®-4 EN Card
100Gb/s Ethernet Adapter Card

Single/Dual-Port 100-Gigabit Ethernet Adapter Cards

ConnectX®-4 EN network controller with 100Gb/s Ethernet connectivity, provide the highest performance and most flexible solution for high performance, Web 2.0, Cloud, data analytics, database, and storage platforms.

With the exponential growth of data being shared and stored by applications and social networks, the need for high-speed and high performance compute and storage data centers is skyrocketing.

ConnectX-4 EN provides exceptional high performance for the most demanding data centers, public and private clouds, Web2.0 and BigData applications, and Storage systems, enabling today’s corporations to meet the demands of the data explosion.

ConnectX-4 EN provides an unmatched combination of 100Gb/s bandwidth in a single port, the lowest available latency, and specific hardware offloads, addressing both today’s and the next generation’s compute and storage data center demands.

I/O VIRTUALIZATION

ConnectX-4 EN SR-IOV technology provides dedicated adapter resources and guaranteed isolation and protection for virtual machines (VMs) within the server. I/O virtualization with ConnectX-4 EN gives data center administrators better server utilization while reducing cost, power, and cable complexity, allowing more Virtual Machines and more tenants on the same hardware.

OVERLAY NETWORKS

In order to better scale their networks, data center operators often create overlay networks that carry traffic from individual virtual machines over logical tunnels in encapsulated formats such as NVGRE. While this solves network scalability issues, it hides the TCP packet from the hardware offloading engines, placing higher loads on the host CPU. ConnectX-4 effectively addresses this by providing advanced NVGRE and GENEVE hardware offloading engines that encapsulate and de-capsulate the overlay protocol headers, enabling the traditional offloads to be performed on the encapsulated traffic. With ConnectX-4, data center operators can achieve native performance in the new network architecture.

RDMA OVER CONVERGED ETHERNET (RoCE)

ConnectX-4 EN supports RoCE specifications delivering low-latency and high-performance over Ethernet networks. Leveraging data center bridging (DCB) capabilities as well as ConnectX-4 EN advanced congestion control hardware mechanisms, RoCE provides efficient low-latency RDMA services over Layer 2 and Layer 3 networks.
MELLANOX PEERDIRECT™

PeerDirect™ communication provides high efficiency RDMA access by eliminating unnecessary internal data copies between components on the PCIe bus (for example, from GPU to CPU), and therefore significantly reduces application run time. ConnectX-4 advanced acceleration technology enables higher cluster efficiency and scalability to tens of thousands of nodes.

STORAGE ACCELERATION

Storage applications will see improved performance with the higher bandwidth ConnectX-4 EN delivers. Moreover, standard block and file access protocols can leverage RoCE for high-performance storage access. A consolidated compute and storage network achieves significant cost-performance advantages over multi-fabric networks.

ERASURE CODING OFFLOAD

ConnectX-4 EN delivers advanced Erasure Coding offloading capability, enabling distributed Redundant Array (RAID) of Inexpensive Disks, a data storage technology that combines multiple disk drive components into a logical unit for the purposes of data redundancy and performance improvement. ConnectX-4 EN’s Reed-Solomon capability introduces redundant block calculations, which, together with RDMA, achieves high performance and reliable storage access.

SIGNATURE HANDOVER

ConnectX-4 EN supports hardware checking of T10 Data Integrity Field/Protection Information (T10-DIF/PI), reducing the CPU overhead and accelerating delivery of data to the application. Signature handover is handled by the adapter on ingress and/or egress packets, reducing the load on the CPU at the Initiator and/or Target machines.

HOST MANAGEMENT

Mellanox host management and control capabilities include NC-SI over MCTP over SMBus, and MCTP over PCIe - Baseboard Management Controller (BMC) interface, as well as PLDM for Monitor and Control DSP0248 and PLDM for Firmware Update DSP0267.

SOFTWARE SUPPORT

All Mellanox adapter cards are supported by Windows, Linux distributions, VMware, FreeBSD, and Citrix XENServer. ConnectX-4 EN adapters support OpenFabrics-based RDMA protocols and software and are compatible with configuration and management tools from OEMs and operating system vendors.

COMPATIBILITY

<table>
<thead>
<tr>
<th>PCI Express Interface</th>
<th>Operating Systems/Distributions*</th>
<th>Connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>– PCIe Gen 3.0 compliant, 1.1 and 2.0 compatible</td>
<td>– RHEL/CentOS</td>
<td>– Interoperable with 1/10/25/40/50/100Gb Ethernet switches</td>
</tr>
<tr>
<td>– 2.5, 5.0, or 8.0GT/s link rate x16</td>
<td>– Windows</td>
<td>– Passive copper cable with ESD protection</td>
</tr>
<tr>
<td>– Auto-negotiates to x16, x8, x4, x2, or x1</td>
<td>– FreeBSD</td>
<td>– Powered connectors for optical and active cable support</td>
</tr>
<tr>
<td>– Support for MSI/MSI-X mechanisms</td>
<td>– VMware</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– OpenFabrics Enterprise Distribution (OFED)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>– OpenFabrics Windows Distribution (WinOF)</td>
<td></td>
</tr>
</tbody>
</table>
FEATURES

Enhanced Features
- Hardware-based reliable transport
- Collective operations offloads
- Vector collective operations offloads
- Mellanox PeerDirect™ RDMA (aka GPUDirect™) communication acceleration
- On demand paging (ODP) – registration free RDMA memory access
- Advanced Atomic operations
- CPU Offloads
  - RDMA over Converged Ethernet (RoCE)
  - TCP/UDP/IP stateless offload
  - LSO, LRO, checksum offload
  - RSS (can be done on encapsulated packet), TSS, HDS, VLAN insertion / stripping
  - Intelligent interrupt coalescence

Storage Offloads
- RAID offload - erasure coding (Reed-Solomon) offload
- T10 DIF - Signature handover operation at wire speed, for ingress and egress traffic

Overlay Networks
- Stateless offloads for overlay networks and tunneling protocols
- Hardware offload of encapsulation and decapsulation of NVGRE overlay networks

Hardware-Based I/O Virtualization
- Single Root I/OV
- Multi-function per port
- Address translation and protection
- Multiple queues per virtual machine
- Enhanced QoS for vNiCs
- VMware NetQueue support
- Virtualization hierarchies (e.g. NPAR)
  - Virtualizing Physical Functions on a physical port
  - SR-IOV on every Physical Function
  - 1x ingress and egress QoS levels
  - Guaranteed QoS for VMs

Protocol Support
- OpenMPI, IBM PE, OSU MPI (MVAPICH/2), Intel MPI, Platform MPI, UPC, Open SHMEM
- TCP/UDP, MPLS, VXLAN, NVGRE, GENEVE
- iSER, NFS RDMA, SMB Direct
- uDAPL

Management and Control Interfaces
- NC-SI over MCTP over SMBus and NC-SI over MCTP over PCIe - Baseboard Management Controller interface
- PLDM for Monitor and Control (DCT)
- PLDM for Firmware Update (DST)
- SDN management interface for managing the eSwitch
- PC interface for device control and configuration
- General Purpose I/O pins
- SPI interface to Flash
- JTAG, IEEE 1149.1 and IEEE 1149.6

Remote Boot
- Remote boot over Ethernet
- Remote boot over iSCSI
- PXE and UEFI

Table 1 - Part Numbers and Descriptions

<table>
<thead>
<tr>
<th>OPN</th>
<th>Description</th>
<th>Dimensions w/o Bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCX415A-CCAT</td>
<td>ConnectX-4 EN network interface card, 100GbE single-port QSFP28, PCIe3.0 x16, tall bracket, ROHS R6</td>
<td>14.2cm x 6.9cm (Low Profile)</td>
</tr>
<tr>
<td>MCX416A-CCAT</td>
<td>ConnectX-4 EN network interface card, 100GbE dual-port QSFP28, PCIe3.0 x16, tall bracket, ROHS R6</td>
<td>Note: All tall-bracket adapters are shipped with the tall bracket mounted and a short bracket as an accessory.</td>
</tr>
<tr>
<td>MCX415A-BCAT</td>
<td>ConnectX-4 EN network interface card, 40/56GbE single-port QSFP28, PCIe3.0 x16, tall bracket, ROHS R6</td>
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<td>MCX415A-GCAT</td>
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<tr>
<td>MCX413A-BCAT</td>
<td>ConnectX-4 EN network interface card, 40/56GbE single-port QSFP28, PCIe3.0 x8, tall bracket, ROHS R6</td>
<td></td>
</tr>
<tr>
<td>MCX414A-BCAT</td>
<td>ConnectX-4 EN network interface card, 40/56GbE dual-port QSFP28, PCIe3.0 x8, tall bracket, ROHS R6</td>
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