

Mellanox Ethernet Overview

WORLD-CLASS ETHERNET PERFORMANCE

- Maximize workloads with highest industry bandwidth
- I/O virtualization maximizes performance in VMs
- Address latency sensitivity with Intelligent offloads

SUPERIOR PRODUCTIVITY

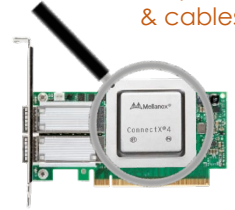
- Optimized for efficient packet processing
- RoCE offloads CPU with sub 1usec latencies
- Scale virtual and physical resources on demand for greater data center agility

Advanced Ethernet Capabilities

MELLANOX: OUR DIFFERENCE IS NETWORK ACCELERATORS

- Founded as a state-of-the-art silicon chip (ASIC) manufacturer
- Intelligence hardware offloads to reduce CPU utilization;
 - RDMA, RoCE, iSER, NVMeoF, Erasure Coding, T10-DIF
- Scale & automate with stateless overlay networks;
 - VXLAN, NVGRE, GENEVE
- Hardware and packet processing accelerators;
 - LRO, LSO, SR-IOV, NetQueue, Virtual-IQ, DPK

Mellanox designs & builds intelligent ASICs that power switches, adapters, & cables



Key Differentiators



PERFORMANCE

- Direct data transfer to memory without CPU intervention
- Hardware-based offload and flow steering engines free CPU cycles (RoCE <1%)
- Proven to accelerate: **Windows Storage Spaces, Red Hat Ceph and VMware VSAN**



VIRTUALIZATION

- Accelerate virtualized networks with **VXLAN, GENEVE & NVGRE**
- Extend hardware resources to 64 PF, 512 VF w/ SR-IOV & ROCE
- Stateless offloads enable near-native performance for VMs
- Align network services with compute services for multitenant network support



STORAGE

- Achieve full potential of flash with 10/25/40/50 & 100G support
- Future-proof with 10/40 & easily upgrade to 25/50 & 100 G Ethernet
- Leverage within scale-out storage to simplify networking
- Alleviate storage network bottlenecks with **RDMA, RoCE and NVMe over Fabric support**



VALUE & FUTURE PROOF

- Ethernet connectivity leader: **10/25/40/50 & 100Gb/s**
- Open FPGA platform for application customization
- Offload **IPsec encryption**
- Deliver 2.5X the performance of 10G
- Future Proof 10G w/ 25/40/50 and 100G capabilities

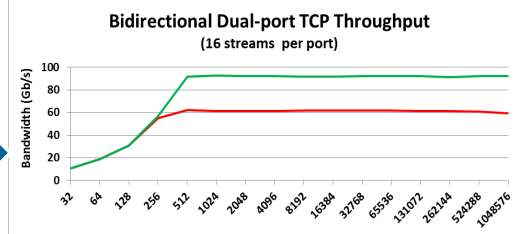
Mellanox Advantages for Lenovo Solutions

- Mellanox offers multiple adapters format to meet each of Lenovo's server requirements: PCIe (full and half) and ML2 form-factor adapters
- Mellanox adapters are recommended for deployment in Windows 2016, VMware, SAP Hana, Cloud, OpenStack, Big Data and Hyperconvergence environments
- Mellanox has the most certifications across all Storage environments : Microsoft Storage Space, Ceph, GPFS, Scality, RozeFS and many others
- Mellanox RDMA low-latency advantages over the competition help eliminate storage bottlenecks and increase efficiencies in Big Data, Hadoop, SMB Direct, VDI and other deployments
- Mellanox deploys full hardware offload to reduce CPU overhead and achieve maximum performance and efficiencies, unlike competitive offerings that utilize imbedded processors and only provide a small performance boost
- Support for advanced networking technologies to remove inefficiencies and increase performance including RDMA, stateless offloads, and tunneling protocol headers

Lenovo 25GE Adapter Performance Comparison: Mellanox vs QLogic

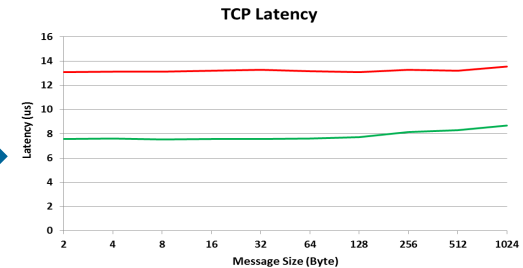
Mellanox Advantage

50% Higher Throughput



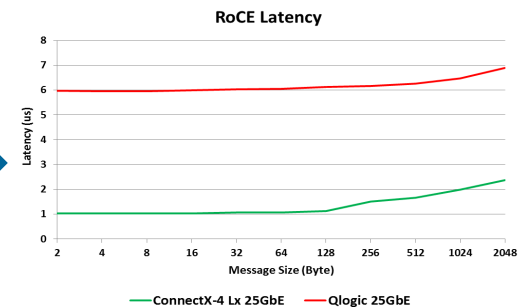
Mellanox Advantage

42% Lower Latency



Mellanox Advantage

83% Lower RoCE Latency



Competitive Comparison

	Mellanox	Avago ^(Emulex)	Broadcom	Chelsio	Intel	SolarFlare	QLogic
Speeds	1/10/25/40/50/ 100 GE	10/40 GE	10/25 GE	10/40 GE	10/40 GE	10/40 GE	25/100 GE
Latency	0.7µs (RoCE)	5µs (RoCE)	1.5µs (claim)	2.5µs (iWARP)	12µs (TCP)	sub-3 µs	13µs (TCP)
Message Rate	100 Mpps (DPDK) 42Mpps (RoCE)	Not available	(claim) 30Mpps	5Mpps (iWARP)	Not available	(claim) 3Mpps	Not available
Tunneling /Overlay Networks	MPLS, VXLAN, QinQ, IPinIP, NVGRE, GENEVE	VXLAN, NVGRE	VXLAN, NVGRE, GENEVE	VXLAN	VXLAN, NVGRE, GENEVE	✗	VXLAN, NVGRE
RDMA	RoCE	RoCE	RoCE	iWARP	✗	✗	RoCE and iWARP by CPU
iSER	✓	✗	✗	✗	✗	✗	✓
Stateless Offload	✓	✓	✓	(TOE) ✓ w/ Limitations	✓	✓	✓

Ethernet Performance

ConnectX-4 Lx	10GE	25GE	40GE	50GE	100GE
Single-port Throughput (TCP)	9.41Gb/s	23.5Gb/s	37.6Gb/s	47Gb/s	93.4Gb/s
RoCE Dual-port Bi-Directional Throughput	37Gb/s	91.4 Gb/s	N/A	N/A	205.7 Gb/s
RoCE Latency	0.8usec	0.8usec	0.7usec	0.8usec	0.75usec
RoCE Message Rate	10.62 Million/sec	26.481 Million/sec	42.37 Million/sec	52.96 Million/sec	99.99 Million / sec

Ordering Part #/Feature Codes

Description	Lenovo Option Part Number
ConnectX-4 Lx 1-port 10/25GE ML2	00MN990
ConnectX-4 Lx 2-port 10/25GE ML2	7ZT7A00507
ConnectX-4 Lx 2-port 10/25GE PCIe (System-x/ThinkSystem)	01GR250
ConnectX-4 Lx 2-port 10/25GE PCIe (ThinkServer)	4XC0G88861
ConnectX-4 Lx 1-port 40GE PCIe	00MM950
ConnectX-4 2-Port 40GE/FDR VPI x8 PCIe	7ZT7A00500
ConnectX-4 1-port 100GE/EDR VPI x16 PCIe	00KH924
ConnectX-4 1-port 100GE/EDR VPI x16 PCIe	00MM960
ConnectX-4 2-port, 40/56GE x16 PCIe	SN30L67871
ConnectX-4 Lx 1-port 10/25GE OCP	SN30M07759
ConnectX-4 Lx 2-port 10/25GE OCP	SN30L26463

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