

# Accelerating iSCSI SAN Storage with Mellanox End-to-End Networking Solution



StarWind iSCSI SAN software coupled with Mellanox Ethernet-based high speed end-to-end infrastructure accelerates storage solution networking connectivity and lowers overall power consumption

## Summary

Current data centers require frequent high speed access between server and storage infrastructures for timely response to customers. Web-based service providers, such as infrastructure as a service (IaaS) or platform as a service (PaaS), provide high speed access to their customers while keeping infrastructure costs low. For a cost-efficient and higher speed requirement, 40GigE infrastructure combined with software-based iSCSI storage provides the best solution.

StarWind SAN iSCSI software running over a Mellanox ConnectX<sup>®</sup>-2 40GigE networking solution provides better performance, high availability (HA) and redundant iSCSI storage solutions at 40Gb/s bandwidth and higher IOPs. The installation time for StarWind iSCSI SAN is very short, and takes only a few minutes. It requires no reboot and is entirely plug-and-play with no downtime.

## Solution Emerges

Under Mellanox Enterprise Datacenter's initiative, StarWind used Mellanox Zorro cluster (See: [www.mellanox.com/content/pages.php?pg=edc\\_cluster](http://www.mellanox.com/content/pages.php?pg=edc_cluster)), to run StarWind iSCSI Initiator on HP DL380 systems with Mellanox ConnectX-2 40GigE NICs. The servers were connected, as shown in the connectivity diagram below (Figure 1). Full

performance benefits were realized over the maximum bandwidth allowed by the PCIe Gen2. A record level of 27Gb/s throughput and 350K IOPs were achieved. The higher speed solution provides faster access to the storage data in an iSCSI fabric.

Solution components:

- 3 servers of Zorro (HP DL380 G6 with 2\*167GB disks, 24GB RAM, 8 cores).
- 6 Mellanox HCAs with 40Gb/s per PCIe Gen2 slot single port, 2 HCAs in each server. FW: 2.7.9470. Ordering Part: MNQH19-XTR
- Connected with 3 subnets (not 40GigE switch), copper QSFP cables.
- OS: Windows 2008 Server R2.
- OFED: driver version 2.1.3.7064.

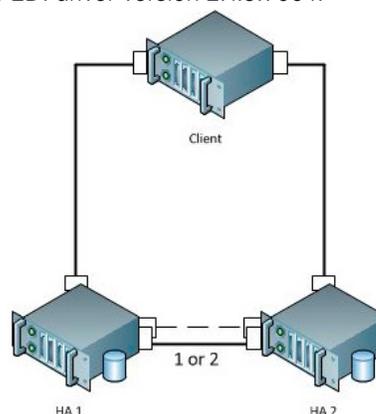


Figure 1: Connectivity Diagram



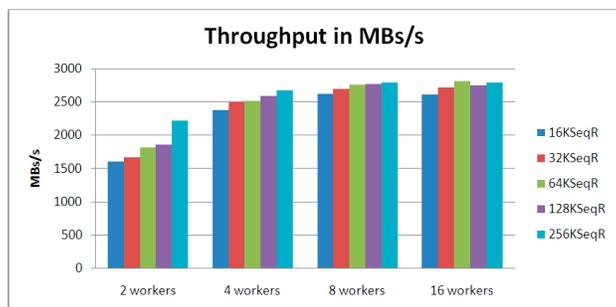
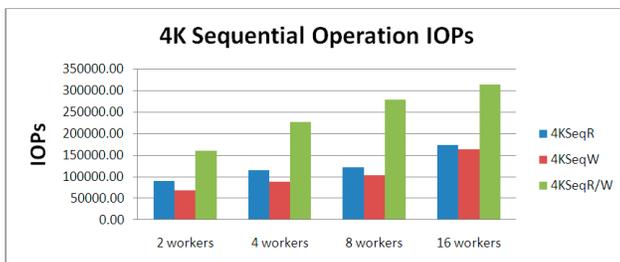
## OVERVIEW

Storage networking software provider StarWind used Mellanox Zorro cluster to run StarWind iSCSI Initiator on HP DL380 systems with Mellanox ConnectX-2 40GigE NICs. Full performance benefits were realized over the maximum bandwidth allowed by the PCIe Gen2. A record level of 27Gbps throughput and 350K IOPs were achieved. The solution provides faster access to the storage data in an iSCSI fabric.

### StarWind achieves record storage connectivity performance

With non-HA configuration (the only node called HA 1 and the client were performing I/O through the single 40Gb/s connection in both directions utilizing full-duplex Ethernet) cluster got 25Gb/s of an iSCSI traffic (due to PCIe Gen 2 system limitations full 40Gb/s wire speed was not reached). Tests with updated PCIe Gen3 hardware wire speed of 40Gb/s over iSCSI can be achieved, without any change in networking hardware, software and StarWind iSCSI SAN software. 300K IOPs at 25Gb/s were achieved with 16 clients using StarWind iSCSI SAN software. This represents a superior performance gain over current iSCSI HBA solutions.

The full HA version (both with HA 1 and HA 2 nodes are processing requests served under Round-Robin policy) achieves the same results as the non-HA configuration but with more workers and deeper I/O queue, which is a shortcoming for Microsoft SW initiator. Every single write went through the wire twice: first from Client to HA 1 (or 2) and then from HA 1 (or 2) to HA 2 (or 1), partner HA node before it got acknowledged as "OK" to Client. Full HA versions can reach non-HA performance with heavy and non-pulsating I/O traffic. A full set of graphs for both IOPs and Gb/s are published below. System RAM was used as a destination I/O target, which mirrors the rising trend of SSD usage in storage servers. A traditional storage stack (another PCIe controller, set of hard disks, etc.) would only add latency to the whole system and limit performance.



### Accelerated cost-effective storage solutions

Consolidating over 40Gb/s networking solution for iSCSI in a virtual environment is recommended for blade server setup, as it will replace four 10GigE individual links. Trunking over 4X 10Gb/s links to achieve 40Gb/s does not work well for iSCSI, as 4KB iSCSI PDU will crawl through only two of four cards put into the trunk, leaving half of the theoretical bandwidth under-loaded. Increased latency with trunking and combined four 10Gb/s cards at a higher cost compared to single 40Gb/s makes consolidated 40Gb/s a more future proof option.

### Summary - Higher ROI has been demonstrated

- 1) Fewer PCIe slots have been used to achieve the same bandwidth (one instead of four).
- 2) Less cables between cluster nodes.
- 3) Lower power solution (single silicon powered and one copper wire instead of four).
- 4) Easier to install and manage.
- 5) Superior scalability solution - higher bandwidth can be achieved using the same number of slots.

Using StarWind iSCSI SAN software version 5.6 with Mellanox ConnectX-2 EN Adapters plus 10Gb/s or higher speeds (preferably 40Gb/s), for current and future x86 servers along with PCIe Gen2 and PCIe Gen 3-enabled systems, is the most cost and power-efficient software-based iSCSI end-to-end solution for virtualized and non-virtualized environments.

### Companies' Information:

StarWind Software is a global leader in storage management and SAN provider software for small to mid-sized businesses and entry-level enterprise companies. StarWind's flagship product iSCSI SAN target turns any industry-standard Windows or Linux server into a fault-tolerant, high performance and fail-safe iSCSI SAN appliance. It has been qualified to support virtualized datacenter hypervisor providers such as VMware ESX & ESXi, Microsoft Hyper-V and Citrix Xen hypervisors, as well as standard operating systems like Microsoft Windows, Linux & various UNIX environments. StarWind Software provides affordable and flexible high availability SAN solutions at a lower cost for small businesses and cost-conscious IT departments. Advanced enterprise-class features include Automated Failover and Failback, De-Duplication with variable block size, Distributed Write-Back Caching, Remote Replication across a WAN, Continuous Data Protection (CDP), Snapshots, Thin Provisioning and Virtual Tape Library management.

Mellanox Technologies (NASDAQ: MLNX, TASE: MLNX) is a leading supplier of end-to-end InfiniBand and Ethernet connectivity solutions and services for servers and storage. Mellanox products optimize data center performance and deliver industry-leading bandwidth, scalability, power conservation and cost-effectiveness while converging multiple legacy network technologies into one future-proof architecture. The company offers innovative solutions that address a wide range of markets including HPC, enterprise, mega warehouse data centers, cloud computing, Internet and Web 2.0.



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