

iWARP/RDMA Benefits for Media & Entertainment Workflows

Executive Summary

The digital film is rapidly evolving to 4K and beyond. As the Media & Entertainment industry moves towards higher resolution and multi-camera mode of production, the need for high performance as well as high capacity storage devices is increasing like never before. This pressing need for fast and scalable storage is seen across the entire lifecycle of digital content Capture, Creation, Editing, Archiving and Distribution.

SMB Direct, or SMB (Server Message Block) over RDMA (Remote Data Memory Access), is a networking offload technology which makes data transfers between clients and file servers faster and more efficient without involving the host's CPU. It achieves this by using techniques such as Zero Copy, Kernel Bypass and CPU Offload. This results in increased throughput, reduced latency, and the CPU power is freed up for time-critical performance-intensive media workloads like studio editing, rendering, post-production and broadcast while working on large unstructured datasets.

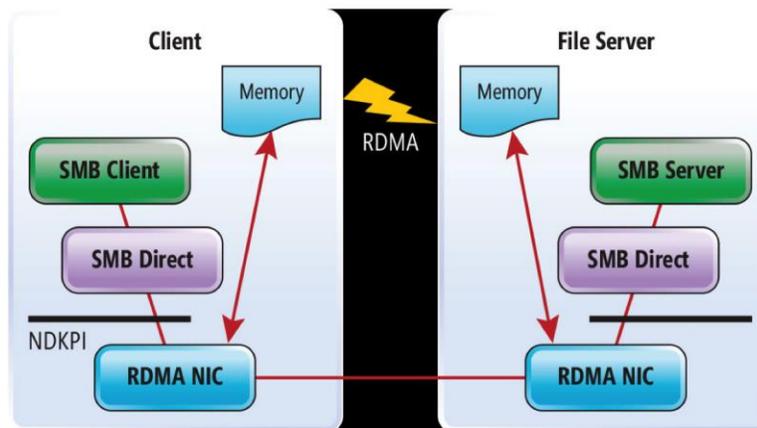


Figure 1 – RDMA NIC End-to-End Topology

The Demonstration

This paper demonstrates how the end-to-end RDMA solution consisting of a RHEL 7.6 server machine running MoSMB SMB Direct enabled server connected to Windows 10 Enterprise client machine, both using Chelsio 100Gb Ethernet Unified Wire adapters enables high speed data transfer of 4K video frames which constitute the building block of modern media workflows.

MoSMB, Ryussi Technologies' SMB 3 file server supports SMB Direct natively and has been purpose built to meet the challenges of the most demanding workflows in media production. Its support for Ethernet iWARP (RDMA/TCP) NICs enables it to support extremely fast data transfer with client-to-file server performance almost equaling that of using local storage.

Windows 10 Enterprise provides built-in support for using RDMA/SMB Direct client with Ethernet iWARP (RDMA/TCP) NICs, to support high-speed data transfers. RDMA NICs offload the host CPU, resulting in a high performance and more efficient solution.

Chelsio’s Terminator 6 (T6) ASIC solution offers a high performance, robust implementation of iWARP RDMA over 1/10/25/40/50/100Gb Ethernet Unified Wire adapters, delivering end-to-end RDMA latency that is comparable to InfiniBand, using a standard Ethernet infrastructure. It is a plug-and-play, highly reliable and mature protocol that enables direct data placement, CPU savings, and RDMA functionality over TCP/IP and legacy Ethernet switches and Internet with no performance penalties. Chelsio iWARP RDMA is in production today and drivers are in-boxed.

Test Configuration

The following sections provide the test setup and configuration details.

Topology

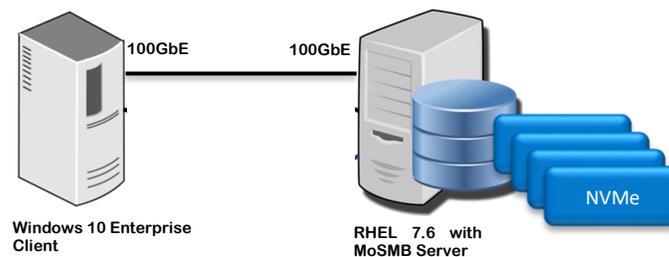


Figure 2 – Test Setup

Network Configuration

The demo utilizes 2 nodes, connected back-to-back, using single 100GbE link. MTU of 9000B is used. Each node is equipped with the following hardware:

- 4x Intel Xeon E5-2690v2 3.0Ghz (40c, HT enabled)
- 256GB DDR4 RAM
- 1x Chelsio T62100-CR (Dual Port 100Gb PCIe 3.0 x16)

RHEL 7.6 OS node running MoSMB v3.1.0: The server node is installed with RHEL 7.6 operating system, MoSMB v3.1.0 SMB3 server. The storage includes 4 NVMe SSD devices. The disks were formatted with XFS file system with default options.

Windows 10 Enterprise node with 100GbE connectivity: The client node is installed with Microsoft Windows 10 Enterprise operating system.

Chelsio inbox drivers are used on both the nodes for configuring Chelsio adapters.

Command used

READ: diskspd.exe -Rtext -b1m -r -w0 -t2 -o8 -W10 -C10 -d60 -D -L -ft W:\testfile.dat X:\testfile.dat Y:\testfile.dat Z:\testfile.dat

Test Results

Read IOPS	Read BW (Gbps)	%CPU utilization
11608.71	92.86968	2.49%

92.869 Gbps READ throughput was achieved at 1M I/O size using 2 thread/file (8 total), 8 outstanding random I/Os per thread (8 x 8 = 64 total) with the average CPU utilization being 2.49%.

Command used

WRITE: frametest.exe -w 4k -n 2000 -t 20 W:\Frametest\

Test Results

Frames Per second	MBytes per second	Frames Dropped
91.28	4660	0

91.28 FPS was achieved by single frametest instance with 4k frames using 20 threads and 2000 frames.

Command used

READ: frametest.exe -r 4k -n 2000 -t 20 W:\Frametest\

Test Results

Frames Per second	MBytes per second	Frames Dropped
84	4193	0

84 FPS was achieved by single frametest instance with 4k frames using 20 threads and 2000 frames.

Conclusion

The results showcase how Chelsio's iWARP RDMA enabled NIC delivers ground breaking performance of ~93 Gbps over SMB protocol using SMB Direct-enabled MoSMB Server. The performance is achieved using standard Ethernet infrastructure.

The results also demonstrate that the combined solution delivers 84 Read FPS and 91 Write FPS for 4K frames for single client, making it well suited for demanding 4K media workflows like rendering, animation, editing, post-production, color correction, VFX or virtual reality.

To summarize, Chelsio offload capabilities enable high performance I/O combined with low CPU usage for cutting edge media workflows.