BENCHMARK

ATTO

FastFrame™ 10/25/40/50/100GbE

ATTO ETHERNET CARDS WITH RoCE OUTPERFORM iWARP

OVERVIEW

ATTO Technology, Inc. has been a worldwide leader in data and storage connectivity for 30 years and remains a leader for high-performance, low-latency connectivity to Ethernet networks. ATTO FastFrame™ network interface cards (NICs) utilize Remote Direct Memory Access (RDMA) to provide direct access from the memory of one computer to the memory of another, all without involving either unit's operating system. This technology enables high-throughput, low-latency networking with low CPU utilization, which is especially useful in data-intensive environments, including massive parallel compute clusters.

RDMA over Converged Ethernet (RoCE) is the most commonly used RDMA technology for Ethernet networks and is deployed at scale in some of the largest "hyper-scale" data centers and installations in the world. RoCE is the only industry-standard Ethernet-based RDMA solution with a multi-vendor ecosystem, delivering network adapters and operating over standard layer-2 and layer-3 Ethernet switches. RoCE technology is standardized within industry organizations including the InfiniBand Trade Association (IBTA), the Institute of Electrical and Electronics Engineers (IEEE) and the Internet Engineering Task Force (IEFT).
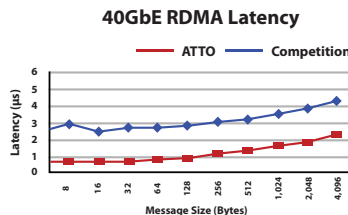
Internet Wide Area RDMA Protocol (iWARP) is a competing computer networking protocol that implements RDMA for data transfer over existing TCP transport internet protocol (TCP/IP) networks. The benefits of iWARP include the ability to deploy in a broad range of environments, but at the expense of

added latency and lower performance when compared to RoCE. ATTO has decided to use RoCE for it's FastFrame products.

BENCHMARK RESULTS - RDMA LATENCY

Error data and correction latency-sensitive applications, such as Hadoop, for real-time data analysis are the cornerstones of competitiveness for Web 2.0 and big data providers. Such platforms can benefit from FastFrame, as its RoCE solution delivers extremely low latencies on Ethernet while scaling to handle millions of messages per second. A benchmark was run comparing the performance of a competitor's messaging application running over iWARP and FastFrame with RoCE, demonstrating that RoCE consistently delivered messages significantly faster than over iWARP.

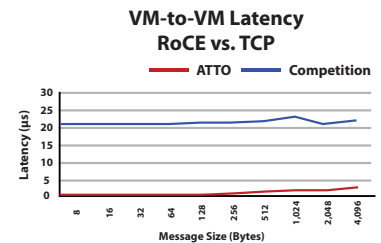### BENCHMARK —

40GbE RDMA Latency

VM TO VM, RoCE VS. TCP

A further advantage to RoCE is its ability to run single root input/output virtualization (SR-IOV), enabling RoCE's superior performance of the lowest latency, lowest CPU utilization and maximum throughput in a virtualized environment. RoCE can provide less than one microsecond of latency between virtual machines (VMs) while maintaining consistent throughput as

the virtual environment scales. iWARP does not run over multiple VMs in SR-IOV, relying instead of TCP for VM-to-VM communication. The difference in latency is significant.

SUMMARY

ATTO FastFrame 10/25/40/50/100GbE NIC utilizing RoCE simplifies the

VM-to-VM Latency RoCE vs. TCP

transport protocol; it bypasses the TCP stack to enable true and scalable RDMA operations, resulting in higher return on investment. RoCE is a standard protocol, built specifically with data center traffic in mind and with consideration paid to latency, performance and CPU utilization. It performs well in virtualized environments. When a network runs over Ethernet, RoCE provides a superior solution compared to iWARP. For the enterprise data center seeking the ultimate performance, RoCE is clearly the superior choice, especially when latency-sensitive applications are utilized. Furthermore, RoCE is currently in dozens of data centers with up to hundreds of thousands of nodes in use. Simply put, RoCE is the obvious way to deploy RDMA over Ethernet.