CASE STUDY

RNA Networks Memory Virtualization Solution Using RNA MVX and Mellanox ConnectX®-2 EN with RoCE Accelerates Business Analytics by 10 Times

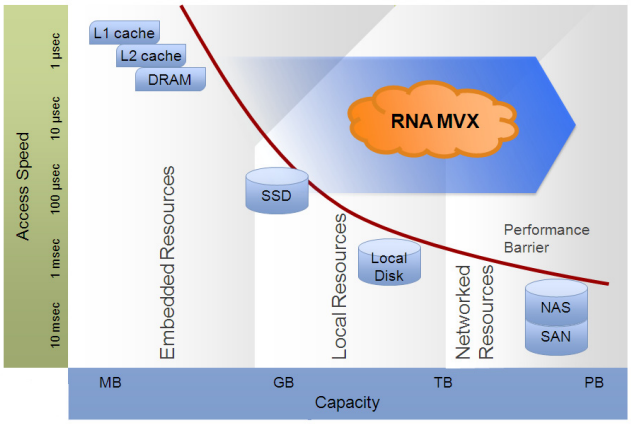
Introduction

Memory available to applications impacts their performance critically. Memory bound to the physical server it is installed constrains performance by limiting the amount of RAM available to an application. Availability in a server is bound to a box and constrains performance. Applications are hungry for memory due to growing data sets and the need to accelerate analysis to achieve a competitive advantage. Commonly utilized solutions using large memory are expensive, don't scale well and typically do not support the application workload within 12 months of deployment. .

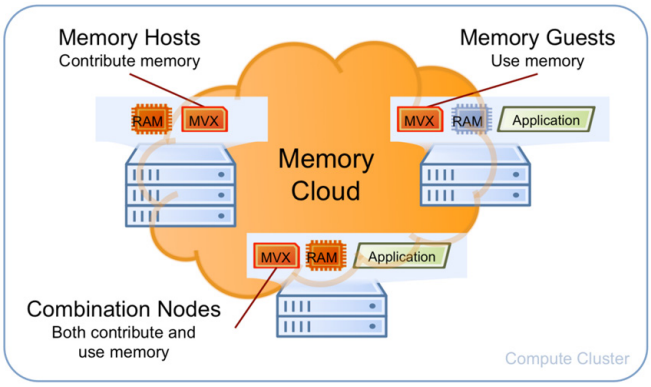
Memory virtualization using RNA MVX breaks the memory box barrier, decoupling memory from the physical server making a shareable distributed memory cloud which enables faster applications, bigger data sets and better business results. A key to delivering the memory cloud with MVX is a compute cluster connected using efficient server interconnect such as Mellanox's ConnectX-2 product that enables high performance and efficient memory virtualization using choice of 40Gb/s InfiniBand or 10Gb/s Ethernet. This white paper explores the use and benefits of Mellanox ConnectX-2 EN with RoCE (10GigE NIC with RDMA over Ethernet) with RNA MVX. ConnectX-2 EN with RoCE is based on the industry standard RoCE (RDMA over Converged Ethernet) specification. Using a purpose built, efficient and field-proven RDMA (Remote Direct memory Access for extremely low latency server to server communication), ConnectX-2 EN with RoCE delivers wire speed throughput and the lowest latency in the industry for 10GigE fabrics (up to 1/10th compared to any other industry standard RDMA over Ethernet solutions).

RNA MVX Solution and Capabilities

RNA MVX delivers one of the industry's highest access speeds for datasets with tens of terabytes in size.



MVX delivers this performance by creating a memory cloud that utilizes commodity compute nodes clustered together using a high performance and low latency interconnect. Such compute nodes have local RAM and MVX software installed on them. The compute nodes can be Memory Hosts, Memory Guests or Combination Nodes. See figure below. Memory Hosts contribute memory into the memory cloud that is available to applications. Memory Guests host the applications and uses the memory cloud enabled by MVX. Combination Nodes are a hybrid – both contribute memory and use memory by hosting applications.

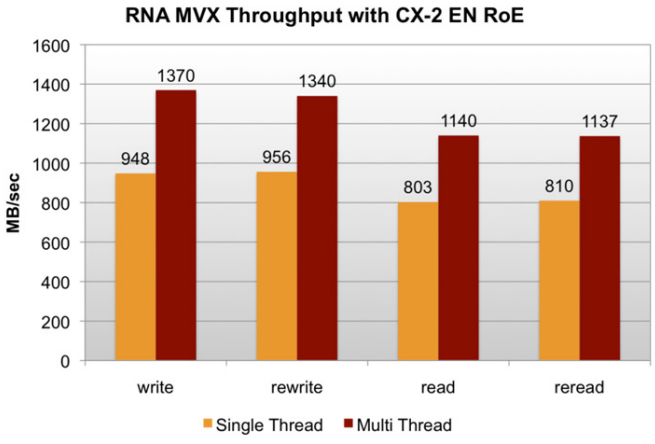


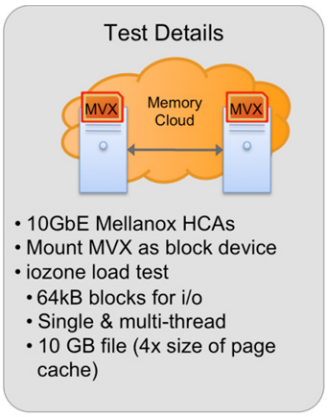
Using this simple and scalable clustering based architecture; RNA MVX can serve many applications such as:

- Large scale analytics with benefits such as memory aggregation, swap memory, dynamic memory
- Real time market response applications with benefits such as ultra high performance messaging, memory based transport
- Applications requiring massive data sets with benefits such as file system offload, database offload, storage tiering
- Cloud computing elasticity and flexibility with benefits such as server virtualization, memory as a service and memory management

RNA MVX Benchmarks Using Mellanox ConnectX-2 EN with RoCE

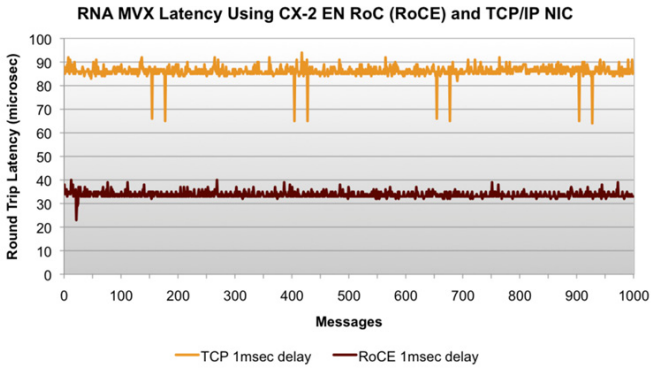
The following are throughput and latency results:

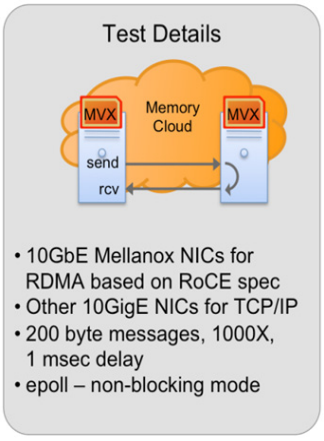




The chart above shows that ConnectX-2 EN with RoCE enables RNA MVX to achieve maximum possible throughput using a 10GigE NIC adapter.

The chart below shows that ConnectX-2 EN with RoCE enables RNA MVX to achieve 1/3rd the latency using other 10GigE NICs using TCP/IP (that is not using RDMA and kernel bypass enabled by RoCE).





Application and Business Benefits of the Combined Solution

The above benchmarks are cornerstones of compelling application and business level benefits. For example, business or web analytics applications enabled by RNA MVX can be accelerated significantly. Compared to proprietary caching solutions, elapsed time required for simulation and testing can be improved by up to ten times. Other possible application level benefits of the above benchmarks are significant faster data access (up to 3X), reduce storage load (by more than 70%), reduce latency (up to 150X) and increase throughput by 5X. Resulting business benefits include increased revenue, reduced costs, IT agility and improved utilization.

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