SOLUTION BRIEF

Accelerate Microsoft SQL Server Performance

Improving SQL Servers efficiency with Mellanox RDMA enabled networking

EXECUTIVE SUMMARY

Microsoft SQL Server is a popular databases software that is widely used for many popular business applications. Organizations using SQL may be looking to deploy virtual servers in their effort to reduce IT costs. However, consolidating the I/O intensive workloads of SQL Server onto a virtual machine may compromise performance or scalability. Similarly, administrators looking for ways to increase performance of their SQL servers are searching for ways to improve efficiencies to enable faster data processing and queries. The introduction of Microsoft Server Message Block (SMB) 3.0 opens new possibilities. Microsoft's SMB Direct (SMB over Remote Direct Memory Access (RDMA)), included in the introduction, adds new functionality and improves performance. With RDMA enabled, SQL Server environments can run over commodity file servers and still deliver SAN-level performance and availability at a fraction of the cost. As administrators are look for ways to improve on efficiencies in SQL environments, more are investing in the deployment of RDMA enabled interconnects and virtualized data centers to improve performance without losing benefits. Mellanox RDMA enabled interconnects remove CPU overhead and provides faster and more efficient access to data, improving on efficiency and allowing enterprise applications to scale.

INCREASING SQL EFFICIENCY

Mellanox ConnectX®-5 Ethernet adapters support RDMA at 10/25/40/50 and 100Gb/s Ethernet speeds and provide the highest performance and most flexible solution for high-performance RDMA implementations. RDMA provides low latency by removing processing of the protocol stack for data transmission from the operating system, allowing applications to directly read and write to remote virtual memory and to directly exchange messages. This drastically reduces the CPU's involvement in data I/O requests and reduces memory

SOLUTION HIGHLIGHTS

- Improved I/O rates allowing SQL Server to be deployed in virtualized environments
- Lower latencies & CPU utilization
- Increased transactions per second
- Decreased average response times
- Dynamic on-demand scaling

Proof Points:

- 100X faster performance than legacy data warehouse queries*
- Up to 50X faster data query*
- Up to 2X the data loading rate*
- 2X better CPU efficiency
- 2X higher bandwidth at lower CPU utilization

*Source: Ted Kummert Keynotes at Pass Summit 2012 ; http://www.sqlpass.org/summit/2012/DayOneKeynote.aspx

bandwidth bottlenecks. Mellanox RDMA technologies process all transport protocol in the adapter hardware, completely bypassing the host OS. This permits the adapters to transfer data between servers and storage with minimum involvement from the host CPU. As a result, SMB Direct is extremely fast with client-to-file server performance, equaling solution that use locally attached storage. The CPU reduction in this process leaves more cycles available for server applications. As a result, even I/O intensive workloads like those of SQL Server are able to be consolidated and ran over virtual machines that are capable of achieving the high-performance required to complete data queries quicker.

INCREASING SQL EFFICIENCY

Mellanox RDMA-enabled adapter, using SMB Direct, are required for both the client and file server connections. The SQL database server connects to the scale-out file server using SMB 3.0 and can connect up to 240 disks in a single pool, shared by up to 12 file servers. With Microsoft SQL Server over SMB Direct, SQL Server can access both system and database files from the file servers. By using file servers, this new feature makes it easier and less expensive to deploy a scale-out SQL environment, including clusters, which are capable of delivering extremely high performance. This is true for standard, non-virtualized, as well as virtualized instances of SQL Server. In fact .

Mellanox RDMA promotes a Microsoft standardized and highly manageable SQL environment which helps satisfy even the most challenging business critical storage demands. Delivering extremely high throughput, with very low latency, and low CPU utilization, which enables the remote file server to efficiently scale and resemble local storage from a performance perspective.

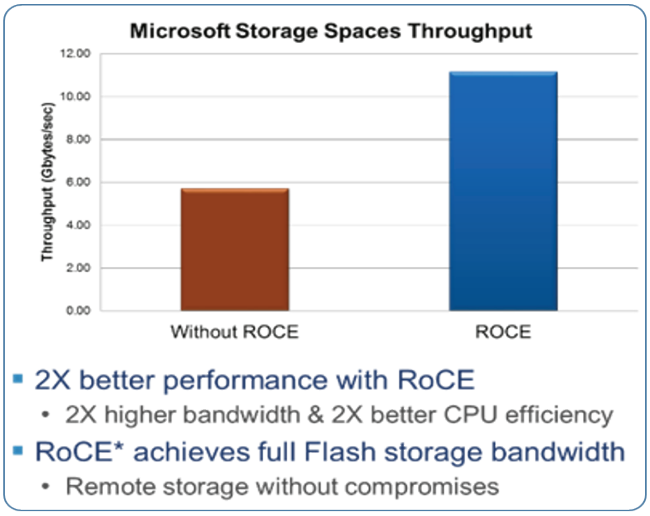

Figure 1 – Testing by Microsoft shows SMB Direct and Mellanox RoCE improve CPU efficiencies.

NETWORK EFFICIENCY

Network virtualization penalties can degrade I/O performance. Consider Ethernet switches with tens of thousands of entries in their MAC forwarding tables. In a virtualized environment where a few hundred servers can host tens of thousands of VMs, this places significant strain on the network as each switch requires access to each of the network forwarding tables. This can create a sever load on the network and a performance degradation occurs. Mellanox switches support a fully virtualized control plane that allow VM's and applications to be hosted on the switch, offering full L2/L3 switching, routing, and data center bridging capabilities that can assist in removing this network virtualization penalty. Mellanox switches also have the ability to process virtualized and containerized data packets at full line rate without dropping packets to ensure network and application performance does not suffer.

CONCLUSION

By using the new SMB 3.0 capabilities that supports native RDMA with Mellanox networking solutions, end-users can increase Microsoft SQL Server database performance while reducing capital and operating expenses. Through consolidating network infrastructure into a single high-speed network and offloading CPU processing reduces strains on servers and efficient networking resources reduce network strain. This allows the SQL Server to obtain maximize computational horsepower and achieve dramatic latency reductions. RoCE and SMB Direct together show better performance when compared to more traditional block data transfer protocols such as Fibre Channel. In fact, Microsoft testing concluded up to 100 times faster performance than legacy data warehouse queries and can handle up to two times the data load rate. Tier-1 applications, such as SQL server, can now be ran on virtualized servers through Microsoft Hyper-V due to these offloads which save CPU cycles, thus increase SQL server efficiency.

About SMB Direct

Microsoft's SMB Direct is a computer networking protocol which utilizes SMB over Remote Direct Memory Access (RDMA) to add new functionality and improve performance. With RDMA enabled, SQL Server environments can run over virtualized servers and utilized commodity file servers as storage and still deliver SAN-level performance and availability at a fraction of the cost

To learn more about Microsoft SMB Direct, visit:

http://www.mellanox.com/related-docs/applications/Windows_Server_2012_File_Storage_SMB_Direct.pdf

For more information visit:

http://www.mellanox.com/related-docs/applications/SB_Accelerating_Remote_Storage_Access.pdf

http://www.mellanox.com/related-docs/applications/Optimizing-MS-SQL-AlwaysOn.pdf

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